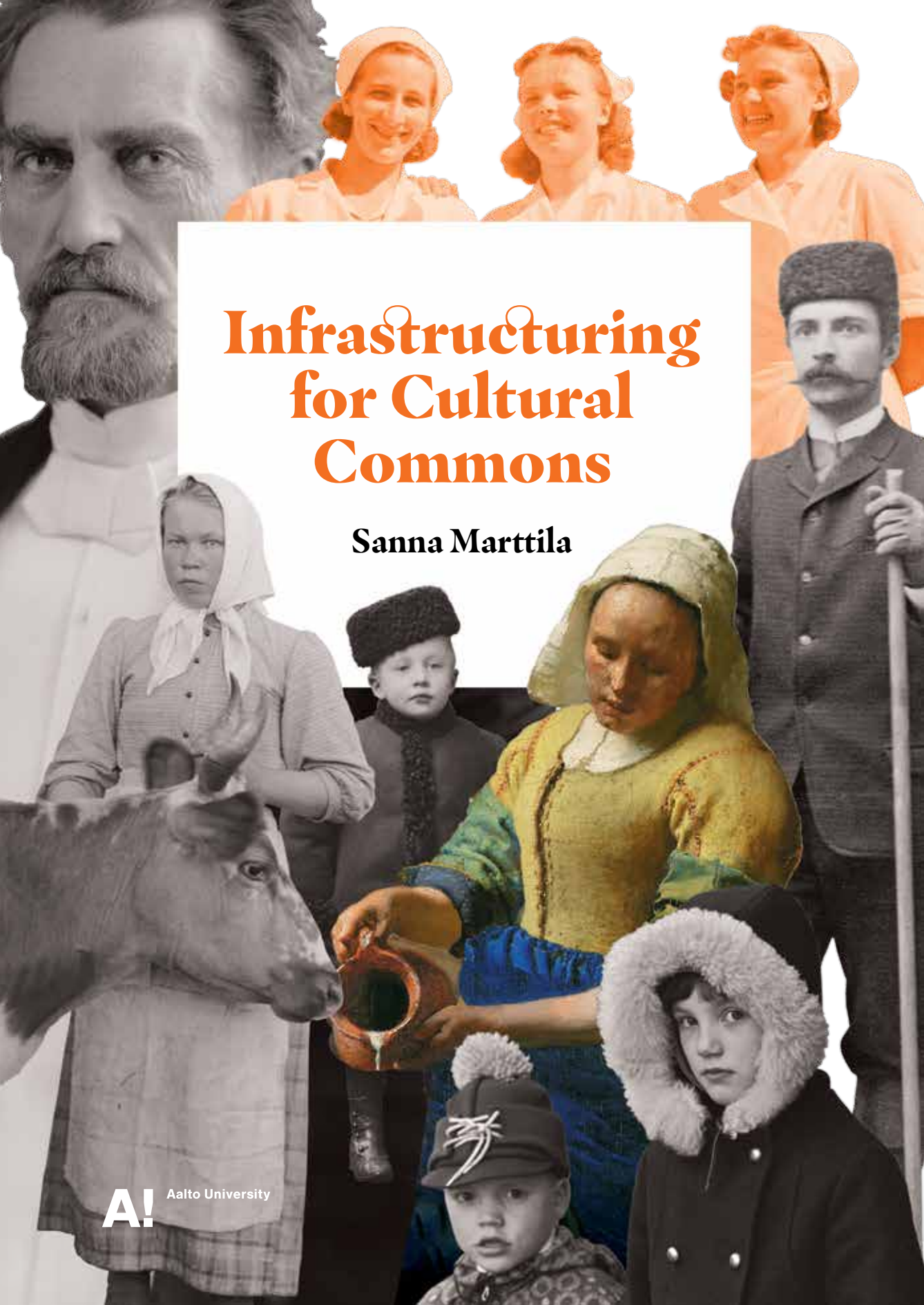

Infrastructuring for Cultural Commons

Sanna Marttila

Aalto University

Infrastructuring for Cultural Commons

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Table of contents

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Lewis Hyde, author of *The Gift. Creativity and the artist in the modern world* (1979) writes that "a gift that cannot be given away ceases to be a gift. The spirit of a gift is kept alive by its constant donation" (p. xix) – *the gift must always move* (p. 4). I hope to keep the invaluable gifts moving, and to be able to pass on the generosity and caring I have received during this unforgettable journey.

Abstract

In this doctoral dissertation, I inquire into the ways in which Participatory Design (PD) and digital design endeavors can contribute to wider public access to, and use of, digital cultural heritage. I advocate for an approach according to which digital cultural heritage is arranged and understood as cultural commons, and for more collaborative modes of social care for and governance of the commons.

In addition to the empirically grounded findings and proposals contained in six individual research articles, I develop a theoretical framework that combines scholarship on Information Infrastructures, Commons and PD. Against this framework I interrogate how the information infrastructures and conditions that surround digital cultural heritage can be active in constructing and contributing to cultural commons. While doing this, I draw attention to the gap that exists between on the one hand official institutional digital cultural heritage collections, systems and practices, and on the other hand the digital platforms and practices through which everyday people create, curate and share digital cultural works. In order to understand how to critically and productively bridge this gap, I present insights gained from conducting three design research cases that engage both cultural heritage institutions and everyday media users. Building upon this empirical work, and latching on to scholarship on the notion of infrastructuring, I propose four infrastructuring strategies for cultural commons: probing and building upon the installed base, stimulating and simulating design and use through gateways, producing and pooling shared resources, and, lastly, fostering and shaping a commons culture that supports commoning.

In exploring these strategies, I map the territory between commons and infrastructuring, and connect these notions to the PD tradition. I do so to sketch the design principles for a design orientation, *commons design*. I assert that these principles can be useful for advancing PD, and can inform future initiatives, aid in identifying infrastructural challenges, and in finding and confirming an orientation to participatory design activities.

Drawing on my practical design work, I discuss requirements for professional designers operating on commons frameworks and with collective action. By doing this, my dissertation not only breaks new theoretical ground through advancing theoretical considerations relevant to contemporary design research, especially the field of PD, but also contributes practical implications useful for professional digital media design practice, especially for designers working in the fields of digital culture and cultural heritage.

Original articles

Article 1.
Marttila, Sanna, Hyyppä, Kati & Kommonen, Kari-Hans. (2011). "Co-Design of a Software Toolkit for Media Practices: P2P-Fusion Case Study", New Media Technologies and User Empowerment. Jo Pierson, Enid Mante-Meijer and Eugène Loos (Eds.). Peter Lang - International Academic Publishers, USA.

Article 2.
Marttila Sanna & Botero Andrea. (2013). "The 'Openness Turn' in Co-Design. From Usability, Sociability and Designability Towards Openness". In Co-create 2013, the boundary-crossing conference on Co-design in Innovation. Espoo, Finland: Aalto University. p. 99–110.

Article 3.
Marttila, Sanna & Hyyppä, Kati. (2014b). "Rights to Remember? How Copyrights Complicate Media Design". In Proceedings 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational (NordiCHI'14), ACM, Oct. 2014.

Article 4.
Marttila Sanna, Botero Andrea & Saad-Sulonen, Joanna. (2014). "Towards commons design in participatory design". In Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium papers, and Keynote abstracts - Volume 2.

Article 5.
Marttila, Sanna. (2016). "From Rules in Use to Culture in Use – Commoning and Infrastructuring Practices in an Open Cultural Movement". In Proceedings of the Design Research Society Conference 2016. Design + Research + Society. Future-Focused Thinking.

Article 6.
Marttila, Sanna. & Botero, Andrea. "Infrastructuring for Cultural Commons". In Computer Supported Cooperative Work (2017) 26: 97.

Note on co-authored articles

Article 1 is an article written together with Kati Hyyppä and Kari-Hans Kommonen. As the main author I set the topic and structure of the article. Hyyppä, who was part of the co-design process in Fusion, contributed in writing to the parts describing the co-design communities and their activities. As principal investigator of the project Kommonen contributed with comments to the whole article, and contributed in writing to the conclusions and future work sections of the article.

Article 2 I co-wrote together with Andrea Botero. I was the main author and responsible for setting the approach, topic and structure for the article. Botero particularly contributed to the development of the concluding table that summarizes the co-design turns, and contributed with comments during the whole writing process.

Article 3 was written in collaboration with Kati Hyyppä. The article presents findings from a survey that Hyyppä and I carried out together. I was the main author and responsible for the topic, approach and frame of the article. Hyyppä is responsible for the co-design section of Virtual Exhibition builder. Hyyppä also provided valuable comments and feedback to the overall article and its findings.

Article 4 is written in collaboration with Andrea Botero and Joanna Saad-Sulonen. The paper is one of the outcomes of our collaborative work on commons and its relation to Participatory Design. As the main author, I set the approach and structure of the paper. We wrote the introduction and conclusions of the article together.

Article 6 was written together with Andrea Botero. As the main author, I developed the conceptual and theoretical framing of the article. I was responsible for writing Case 2, and contributing to Case 1 that Botero co-wrote with me. Botero contributed to the theoretical framework chapter, especially to the infrastructure and infrastructuring sections. She also contributed with comments throughout the writing process.

The Society of Swedish Literature in Finland

1. Introduction

Our history is a vital part of our future. Access to our cultural heritage, which has been passed down by previous generations, is a key to explaining and exploring our shared past. In the past decades, much has changed about how people can access cultural heritage and engage with it. One such change is the technological advancements and associated social practices that have enabled cultural heritage institutions, such as libraries, archives and museums, to digitize their holdings. In tandem with how the digital age has affected the tools used by cultural heritage institutions, digitization has changed the ways in which people can participate in the creation, production and distribution of digital culture.

New capabilities have given heritage institutions possibilities for storing and sharing our common culture and history by creating digital reproductions and copies of cultural objects and artefacts, such as electronic archival records, paintings, maps and audiovisual materials. Earlier, these holdings had to be kept locked away in closed storage facilities with only limited professional access and often absolutely no access for the public. Starting from pilot projects and experiments in the 1990s, large-scale conservation and digitization initiatives are nowadays mainstream among cultural heritage institutions. Along with these advancements, the digital age has brought constant change, uncertainty and pressure to the heritage institutions on two main fronts. First, to develop and maintain, together with other institutions, joint access-points and interfaces for digitized cultural heritage and data online. This cross-border collaboration has blurred the boundaries between different institutions and affected their core professional practices (Rayward 1998, Pruulmann-Vengerfeldt and Aljas 2009). Second, the digitization of cultural heritage creates demands for institutions to offer wider means for their diverse au-

diences and general public to engage with the growing body of digital collections. Inviting people to interact with the digital collections could enable new channels and means for enjoying and experiencing culture and history, and could encourage appropriation and creative re-use of these collections by various sectors of society. At the same time, it requires the institutions to acquire new expertise and skills.

In the same period as these institutional efforts to digitize cultural heritage and create wider public access to digital collections have taken place, social media platforms and countless digital tools have been booming on the Internet, and people have developed new ways of participating in the production and distribution of digitized expressions of culture (Jenkins 2006, Benkler 2002, 2006, Bauwens 2009). In the current media landscape, where people's media use and practices are intertwined with media consumption, it has become evident that some groups have taken a more active role in participating in the design and production of their 'media everyday', a space that was before reserved for professional designers and established actors (Löwgren and Reimer 2012, 2013). The wider user participation not only changes digital culture and its creation, it fundamentally alters the design and development of the infrastructures and structures they rely on (Manovich 2001, Bruns 2008, Schäfer 2011).[1] This, along with abundance of both amateur and professionally produced media, presents new demands and challenges to contemporary design research and professional digital and media design practice, especially in terms of understanding what participation and collaboration means in the design of Information and Communication Technologies (ICT) for digital cultural heritage and for systems involved in everyday and professional cultural production.

A multitude of new technology systems and infrastructures have been or are being developed to facilitate and foster access to digital collections and engagement with institutional digital cultural heritage. At the same time, there are plenty of novel platforms and systems for exploring and engaging with everyday creativity and cultural production online. However, less efforts have been placed on understanding how to collectively form and foster digital culture heritage collections at

1 During the first decade of 2000 a great deal of literature was written about the participating audiences and participatory media, and its modalities and characteristics. To review this body of knowledge is not within the scope of this study, but I have highlighted here some of the writings that investigate the connection of cultural and media production, rather than focusing on the logic of participation on online platform. For these, see e.g. Nielsen (2006), O'Reilly (2005).

the intersection between established institutions and ordinary people, and I argue that there is a gap between the practices of one and the other. At present, we know little about how to collaboratively design information infrastructures that would support and sustain shared forms of digital cultural heritage production, and this lack of in-depth knowledge keeps design from supporting effectively the building of the digital cultural commons and bridging the gap between citizens and established institutions. Thus, my contribution in this dissertation is to develop a design approach that sets out strategies and principles for infrastructuring for cultural commons.

1.1 Research area and theoretical stances

In this doctoral dissertation I study how participatory design and digital design endeavors can contribute to a wider public access to digital cultural heritage[2]. Here, the understanding of the notion of digital cultural heritage is threefold: First, digital cultural heritage is understood as digital artefacts and materials that are implemented in digital technologies, and secondly as interactions, relationships and boundaries created and performed in the digital domain (cf. Cameron and Kenderdine 2007). Thirdly, digital cultural heritage is understood as a cultural practice, an on-going dynamic and relational process of engagement, of negotiation and articulation of identity, values and cultural and social meanings, practiced by citizens and institutions (Smith 2006). In my doctoral work all three of these facets are relevant, and especially, I focus on the interconnections and crossings between digital cultural heritage, either digitized or born-digital assets, and digital cultural production by citizens.

In motivating my research, I point to a gap between the official institutional digital cultural heritage collections and systems, and the digital platforms through

2 The UNESCO Charter on the Preservation of Cultural Heritage (2003) defines digital cultural heritage as "resources of information and creative expression are increasingly produced, distributed, accessed and maintained in digital form, creating a new legacy – the digital heritage". These materials include a variety of outcomes of creative activities such as "texts, databases, still and moving images, audio, graphics, software and web pages, among a wide and growing range of formats" (p. 74).

which ordinary people – citizens – create and share digital cultural works. My work aims to support the bridging of this gap by providing empirical insights from three real-life design research cases working with both sides – cultural heritage institutions and everyday media users. Central to my research is to explore and propose design strategies for collaborative infrastructuring for digital cultural heritage. In my study, I interrogate how infrastructural work can be active in constructing and contributing to cultural commons. By presenting insights and findings from the participatory and collaborative design (co-design) efforts in the three design cases that form the empirical part of my work, my thesis addresses the complexity of, possibilities in, and limits for infrastructuring for cultural commons.

The concept of *commons* plays a significant role in how I frame, understand and analyze my three design cases. I understand commons as particular social arrangements for managing and governing shared resources either locally (Ostrom 1990, Ostrom and Hess 2007), or, in some cases, as public and open access commons (Benkler 2006, 2013) that are cared for through collective action and commoning (Bollier and Helfrich 2012). My focus is particularly on the characteristics of the concept that has lately been referred to as *cultural commons* (Madison et al. 2010, Hyde 2010, Hess 2012, Bertacchini 2012). Another key concept in my doctoral research is *infrastructuring.* Here, I build upon research originating from the Science and Technology Studies (STS) tradition and the seminal work of Star (1999) and Star and Ruhleder (1994, 1996) in which they – rather than giving priority to individual technology systems or artefacts – focus on relational and contextual aspects of information infrastructures, as well as on considering people and their situated actions in infrastructural development. The idea of seeing design as infrastructur*ing* (Karasti and Syrjänen, 2004, Karasti and Baker 2004, Pipek and Wulf 2009) stems from a recognition of the importance of drawing attention not to *what* an infrastructure is but *when*, *how* and *for whom* infrastructures become (Star and Ruhleder 1995, see also Star and Bowker, 2006, Ehn 2008, Karasti 2014). These theoretical foundations will be elaborated in Chapter 2.

My research is multi-disciplinary, and it is situated in the intersection of Participatory Design (PD), Human-Computer Interaction (HCI), and Computer Supported Collaborative Work (CSCW). My work builds on the traditions in design research that see design as participatory and collaborative processes. It also in particular builds on scholarly work that draws on the concept of commons – to better capture and articulate the emerging modes of digital culture use, cultural

production and collaborative design in collective and open-ended settings. The commons literature spans economic, legal, and activist-practitioner perspectives. To better understand the collaboration and collective action amongst diverse audiences – and their engagement in the use and production of digital culture and media on the Internet – I also tap into scholarly work coming from cultural and media studies. This eclecticism in the use of scientific literature is warranted by the multifaceted nature of the ill-structured 'wicked problems' I study (cf. Rittel and Webber 1973), as these involve legal issues, social practices, state and private institutions, cultures and subcultures, technological systems and the use thereof.

That design scholars are drawing from the STS literature is in itself nothing new (cf. Woodhouse and Patton 2004). However, there has been a growing interest, especially in PD, in studying information infrastructures, understanding their socio-material-technical characteristics and applying history and theory from infrastructure studies, a field within STS, or framing their investigations in terms of infrastructures. The current nexus of infrastructural design is concerned with the intersection of technical design and peoples' related social and media practices, with an aim to integrate these practices and existing systems and tools with new structures being developed (Ehn 2008, Björgvinsson et al. 2010, 2012a, DiSalvo 2012). Research on the collaborative design of infrastructures for digital cultural heritage, the specific research topic I am addressing, has devoted some discussion to the "becoming of" or "making of" of an infrastructure (Karasti et al. 2010, Björgvinsson 2014, Stuedahl et al. 2016) and to which infrastructuring strategies this becoming/making of entails. Karasti and Baker (2004) have put forward a question that is still highly relevant, "How to create infrastructures that are large scale and can operate for the long term?" This becomes ever more so in the age of omnipresent digital infrastructures and for digital cultural heritage. Especially, I argue, it is relevant in contemporary PD endeavors, where democratic design experiments are still often highly centralized and serving primarily local needs (Ehn et al. 2014).

In this doctoral dissertation, I argue that commons and infrastructures are in a deep and inter-dependent relationship; in order for a commons to flourish, it requires a functioning infrastructure that allows for the evolution and expansions of both in coexistence. Through developing infrastructuring strategies, I suggest ways in which professional participatory designers engaging with digital culture and digital cultural heritage could contribute to the longevity and sustainability

of cultural commons, and at the same time strengthen the infrastructure that carries the actors, the digital artefacts and the social practices connected to the infrastructure and to sustaining the commons. In developing this argument, I will draw on some of the recent insights in PD that have identified a need for better understanding the implications of new forms of politics, policies and emerging practices. This literature sees design as concerned with infrastructuring (Ehn 2008, Björgvinsson et al. 2010, 2012a, Hillgren et al. 2011, 2016, DiSalvo et al. 2012, Teli 2015a, 2015b, Le Dantec and DiSalvo, 2013, Seravalli 2014, Linström and Ståhl 2014, Stuedahl et al. 2016, (Stuedahl and Smørdal 2015). This dissertation thus contributes to the developing body of work on infrastructuring, and what infrastructuring may entail in PD. It does so by connecting the commons discourse to the contemporary discussion of infrastructuring, and by bringing insights and findings from the involvement and experiences of the co-design efforts undertaken in the design cases: building two technology platforms for digital culture and cultural heritage, and supporting and engaging with an open culture movement.

1.2 Identifying and addressing gaps in practice and literature

The production and designation of culture and heritage is highly complex, contested and political in our society (Ahmad 2006, Dalbello 2009, Cameron 2010, Silvermann 2016). Bourdieu (1983/1993) described well how individuals, groups and institutions are constantly shaping and competing over the power to create meaning and value of cultural works, and to control or influence what is considered art and culture. Bourdieu's notion of 'field of cultural production' combines aspects of social conditions, circulation and consumption of cultural materials and their relations. This field is occupied by various actors competing for the resources, positions, *symbolic power* and *capital* (e.g. authority, recognition, legitimacy) that the field has to offer. This capital is unevenly distributed among different groups and individuals. In the context of *cultural capital*, some individuals and institutions, according to Bourdieu, have more accumulated capital and can use this to determine, for example, what is considered art and what is designated as cultural heritage. Thus, a central contention of my research is that there is a gap between on one side the official institutional digital cultural heritage collections, systems and practices

for accumulating, governing and making cultural heritage materials accessible, and on the other side the social practices and technological platforms through which citizens and communities create and share digital cultural works. My political aim in my doctoral research work is to point to and propose ways to create more open, equal and symmetrical[3] access to, use and governance of our past, and to contribute to enduring and sustainable cultural commons. For this, then, it is essential to bridge across between ordinary people and cultural heritage institutions. The ways of achieving this depend on the nature of the gap identified above. At the moment the institutions are separated from groups and individuals at least in three significant ways:

First, people have limited access to and possibility to engage with digital cultural heritage materials held by institutions. Despite the long-standing efforts to increase access to digital cultural heritage, today only a small fraction of the digital holdings in Europe are being made accessible to the wider public by cultural institutions (Stroeker and Vogels 2014). In cases where digital cultural heritage materials have been made accessible online, they are often released under restrictive terms of use (Bellini et al. 2014, Estermann et al. 2015, Estermann 2015) and the scope for circulation and collaborative re-use of digital heritage is often limited (Terras 2015, Marttila and Hyyppä 2014a). As argued by many scholars (Tsolis et al. 2011, Anderson 2013), intellectual property rights and other rights issues such as privacy issues are an important factor preventing open access to and use of our digital cultural heritage materials online. This is due, mainly, to practical reasons: the legal regulations and terms of use of digital cultural heritage materials vary greatly, and there is a need for harmonizing the rights and exceptions to copyrights (e.g. non-commercial use, educational use). In addition, often many cultural heritage institutions do not hold the rights to their assets in the digital collections, or institutions do not have enough resources to conduct the process of clearing the rights. Commentators also point out that many cultural heritage institutions fear a loss of authority and control over their collections, or fear losing possible sources of future revenue if they release their digital cultural materials on more open terms (Tsolis et al. 2011, Verwayen et al. 2011).

3 I have adopted the use of term "symmetrical" in connection to commons from Yochai Benkler (see e.g. Benkler 2013, 2017) to convey alignment in access to and use of shared resources.

Second, both institutions' collections of digital cultural heritage and their management differ significantly from commons-based peer production and from the practices encouraged and enabled by the participation platforms on the Internet. Even if the designation of cultural heritage resources are often considered as of public interest, often only official institutional processes and mechanisms direct the selection of heritage assets (e.g. objects, intangible culture) to be reproduced as digital cultural heritage. Furthermore, the maintenance and enrichment of these digitized cultural collections is often guided by rigorously defined best practices, policies and standards. In contrast, the governance and management of commons-based and shared cultural resources online relies more on evolving social practices developed among members of a community or a network in flexible and fluid processes[4] (cf. Benkler 2006, Benkler and Nissembaum 2006, Bruns 2008). Little discussion exists in design research regarding the convergence and co-existence of institutional cultural heritage and commons-based cultural production and heritage practice, and about *how* to bridge official institutional practices and traditions with the production and appropriation practices of the general public (see Stuedahl 2007). This lack of understanding, I argue, is one reason for why cultural heritage institutions continue to struggle with forming fruitful relationships with their audiences and understanding their emerging digital engagement. More importantly, this lack of understanding is also one of the main factors in perpetuating the practices that continue to deny citizens the access to, the use of and the influence on digital cultural heritage materials. This is problematic as heritage is designated in the name of the public, collected for their benefit, and (typically) managed and maintained at the public's expense.

Cultural institutions are increasingly exploring ways to create new collaborations with publics and to open up possibilities for people to curate, collect, contextualize and create cultural works from the institutions' digital collections (see e.g. Adair et al. 2011). Most known, and worth mentioning from an institutional perspective, is Flickr Commons, an online repository that provides open, free access to digital images whose copyrights have expired or are unknown. Other well-known examples are Project Gutenberg, which has developed the oldest major digital library through

4 A well-known example of this flexible process is the community-created folksonomies that emerge through the use of the hashtag symbol (#) on social media. This practice adds additional context and metadata to an item, and aids the navigation and organization of the media materials by forming in a sense a collection of similarly labeled items.

digitizing and archiving literary works[5] since the 1970s, and the Wikimedia community. The GLAM-Wiki initiative has created concrete practices and formed partnerships with heritage institutions that are interested in sharing their collections on Wikipedia and Wikimedia. Through different projects, e.g. Wiki Loves Monuments, or Public Art on Wikipedia, the Wikimedia community has also created alternative cultural heritage repositories, apart from the general social media platforms which also occasionally act as arenas for novel forms of digital culture[6]. Through initiatives like these, institutions and communities alike are attempting to contribute to cultural commons. In these two examples, Flickr and Wikipedia/Wikimedia, the platforms used have first served people and their collaborative efforts (e.g. media sharing), and only later, when user volumes have grown and novel media practices have become more established, have digital cultural heritage institutions joined or started to use the platforms. There are also other recent efforts, such as Europeana Labs[7], that attempt to bring cultural heritage institutions' own platforms and practices together with community practices and community-created content and software (see e.g. Benardou et al. 2017). Nevertheless, in most cases, unfortunately, when cultural heritage institutions pool their collections and offerings for open access, they do not pay sustained attention to people's actual or emerging media practices.[8] It is also common for institutions not to offer means through which people can take part in decision-making or governance of these common-pool resources. This is often also the case when commercial platforms are involved, making the future sustainability of the efforts uncertain, and threatening the harvested or common resources with commercial or institutional co-optation.

Third, institutions' technological systems and tools for allowing access to digital cultural heritage are often incompatible with platforms used by practitioners and

5 At the moment, the Project Gutenberg provides universal access to over 50 000 electronic books. Source and more information: http://www.gutenbergnews.org/about/history-of-project-gutenberg/.

6 For overview of the GLAM-wiki initiative and its projects visit: https://outreach.wikimedia.org/wiki/GLAM.

7 Europana Labs is maintained by Europeana, and its offerings include resources such as APIs, example projects and curated datasets. Visit: https://pro.europeana.eu/page/about-europeana-labs.

8 This said, there are a growing number of community heritage and memory initiatives where groups and individuals preserve their heritage in digital reservoirs and archives (see e.g. Waterton & Watson 2013, Giaccardi 2012, Stuedahl et al. 2016, Ciolfi et al. 2017).

professionals from other domains (e.g. researchers, educators, creative industry), meaning that the system chosen by the institution is not necessarily the one that could benefit their digital repositories the most. Digitalization of libraries, archives and museums has prompted a significant amount of research in their specific fields and domains, as well as in neighboring fields such as information science (for review see Marty 2010). The discourse in Europe has been driven by the European Commission's (EC) cultural policy work that advocated joint "memory institutions" (I will return to the notion of memory institutions in Chapter 3). In addition to this agenda, a strong emphasis has been given to the practical technological and legal issues and challenges hindering digitalization. Aspects related to preservation, management and documentation, technical interoperability, and the development of shared schemas, standards and formats, have received a lot of attention both in academic discourse and in practical work. In addition, large efforts have been invested in designing digitization processes and forming interoperable digital collections with shared data standards and formats (see e.g. Ioannides et al. 2016, Hemsley et al. 2017). In many cases, however, the existing legal frameworks and lack of rights prevents cultural heritage institutions from developing technology platforms that could allow making their digitized collections available.

In scholarly literature CSCW (Computer Supported Collaborative Work), HCI (Human-Computer Interaction) and PD (Participatory Design) communities have made a range of knowledge contributions to the digital cultural heritage domain. In her literature review Ciolfi (2013) traces the engagement in CSCW with cultural heritage to three key areas of interest: 1) The social interaction, engagement, and experience of visitors to heritage collections. 2) The design and development of technologies in relation to cultural heritage, including how this technology use could enhance and mediate visits to the existing heritage sites or institutions. 3) The design and creation of interactive installations, artistic objects and performances that, in themselves, form "a heritage artefact". Nevertheless, collective action and social practices are under-studied themes within the CSCW and cultural heritage literature (Ciolfi 2013). Connecting digital cultural heritage to collaborative infrastructural development and open assets and practices is not common in scholarly work within design research, yet some studies exist. For example, Stuedahl and colleagues have studied the perceptions of professionals and citizens during infrastructural work, and "how they find ways to realize a new openness within the framework of existing practices of their local institution"

(Stuedahl et al. 2016, p. 53). HCI also has a long established interest in studying the cultural heritage domain, and especially in novel interactive systems and services that could be made possible in cultural heritage sites or physical organizations (see e.g. Ficarra et al. 2012, Ciolfi and McLoughlin 2013). These previous studies have been narrower in scope than what I propose in my doctoral work, and have paid little attention to issues of common or shared digital cultural heritage, or to how we can collectively achieve more open access heritage systems.

Theorizing and analyzing the relationship between cultural heritage and technology is also a developed field on its own, however this literature focuses mainly on the issues and practices relevant for professionals in the heritage organizations (e.g. managing and conserving cultural heritage), on the representation of the digital heritage object, or on the outcomes of using technology (e.g. exhibitions, catalogues) (Cameron et al. 2007). In studies on information infrastructures for collecting institutions and/or cultural heritage institutions, the focus has often been on understanding the practices of the official institutions (e.g. documentation, categorization), or visitors, or users of the collections. The question has then been how to enhance access from a technology point-of-view, but rarely aiming at bridging these two different worlds to create more symmetrical ways of negotiating what is our common culture and designated to digital cultural heritage, and how is it governed and maintained. In this dissertation, I aim to do that.

In the cultural heritage sector and related scholarly literature, a lot of effort has been placed to understand what cultural heritage is, and could be, in the digital age. Early accounts focused on the notion of "new heritage" and issues such as digital preservation and forming virtual exhibitions (see e.g. Kalay et al. 2007). Public engagement and participation has been paid attention to especially in collecting institutions such as museums and archives that have a long history of including visitors as participants in their production and dissemination of cultural heritage (Cameron and Kenderdine 2007, Labrador and Chilton 2009, Simon 2010, Owens 2013, Bhowmik 2016). There is also a growing attention to citizen-driven heritage initiatives (Adair et al. 2011, Owens 2013, Giaccardi 2012, Petrelli et al. 2016, Stuedahl et al. 2016, Stuedahl and Smørdal 2015, Ciolfi et al. 2017). A recent study reviewing a large set of scholarly literature and heritage professionals' practices and tools on enabling public engagement of digital heritage concludes that heritage institutions are increasing the speed with which they are applying digital means to enhance the value of the digital collections (King et al. 2016). Thus, exploring

new forms of engagement, such as social enrichment of digital heritage offerings via crowdsourcing, have been popular among the established institutions (see e.g. Ridge 2014, Oomen and Arroyo 2011). Other types of participation include: "acquiring and documenting cultural heritage holdings for museums and other institutions, … generating commentaries and discussion around heritage, … identifying, preserving and communicating heritage" (Ciolfi et al. 2015, p. 149). Often these crowdsourcing efforts, carried out by institutions, assign a pre-defined role and task to participants along with a set of rules the game they can play a part in. To simplify, heritage knowledge production, especially the act of assigning materials to the "canon", has remained with institutions while participation efforts have focused on how to engage and explore with *outcomes* after these cultural and curatorial decisions have been made. Yet, new collaborations between heritage institutions, community-driven initiatives and digital technologies are rapidly emerging, opening opportunities for more on-going and sustained relationships (Ciolfi et al. 2017).

Within the PD field, with which my research aims to be in dialogue, there has been attempts to "democratize" these institutions and "empower" visitors and audiences to engage with official institutional practices and processes. This already vast body of knowledge has applied PD tools and techniques to engage visitors in participatory practices within cultural heritage institutions (e.g. Salgado and Botero 2008, Dindler et al. 2010, Bossen et al. 2012, Stuedahl 2011, Stuedahl and Lowe 2013), to experiment with social media production (Watkins 2007, Stuedahl 2009, Giaccardi 2012, Stuedahl and Smørdal 2015), and designing exhibitions, encounters and experiences with digital cultural heritage (e.g. Salgado 2009, Avram and Maye 2016, Ciolfi et al. 2016). Even when digital technologies are adopted in heritage institutions, and materials are made available in digital form, the ways offered for people to engage with them have remained somewhat the same (McLean 2007, Salgado and Botero 2008). Therefore, there is still a need for more horizontal design approaches and strategies for digital culture and digital cultural heritage.

1.3 Research focus, stance and questions

Given the above challenges, shortcomings and gaps in both scientific literature and professional and everyday practices – i.e. in the heritage sector and within design research – the research problem tackled in this doctoral dissertation is concerned with the relational processes of engagement, negotiation and articulations of digital cultural heritage at the intersection of established cultural institutions and ordinary people. This research focus stems from the current lack of a comprehensive understanding of the tensions and potentials in collaboratively designing infrastructures for digital cultural heritage in more open-ended and collective terms. The focus is also rooted in my personal interest towards opening wider public access to and possibilities for creative reuse of digital cultural heritage materials, and in my "activist academic" position. This notion is borrowed from Pecorelli (2015) and complemented with the "hacktivism" design research approach put forward by von Busch (2008, 2014). The activist academic framing refers to my goal to challenge the current unequal and asymmetrical order in the digital cultural heritage domain. Throughout the dissertation I advocate for an approach according to which digital cultural heritage could be arranged and understood as a cultural commons, and for more collaborative modes of social care for and governance of the commons (Light and Akama 2012). My personal stance – in favor of opening access to our common digital culture and history – stems from two ideological strands: from the Participatory Design approach, and from the Open Culture movement. In the Chapter 3, I return to my political stance and position and its underpinnings.

My research casts light on the challenges and opportunities that contemporary design research and professional design practice, especially PD, faces. New challenges arise when people are increasingly operating in commons frameworks and initiating new forms of participation and collective action, leading to novel modes of cultural creativity and production that rely on social networks, digital platforms and shared common-pool resources on the Internet. To investigate these issues, I have formulated two research questions to underpin my doctoral research:

(1) The first research question is of procedural matter:
How can we collaboratively design socio-material-technical information infrastructures for digital cultural heritage in more open and symmetrical terms?

Taking on board recent work on infrastructuring, I can further specify this question: What infrastructuring strategies could be constructive for institutions seeking to create open and meaningful access for digital cultural heritage collections, and for enabling and sustaining collaboration between various actors? Conversely, what commoning tactics and practices could be beneficial for people's increasingly complex creative pursuits with digital culture and cultural heritage materials?

(2) The second question follows the insights obtained from enquiry of the first question:
What are the requirements for a professional digital media designer and design researcher engaged in the above forms of participatory design?

To specify this question in practical terms, this question leads me to probe initial principles and orientation for designers operating in open-ended and communal settings, and to discuss and reflect on how these directions could affect designers understanding of their PD practice. Here, requirements refer to a set of new skills, capabilities and attitudes.

To answer these research questions, I analyze and reflect on my participation in the collaborative design and development of two information systems: Fusion and EUscreen. These are both technology platforms aimed at contributing to wider access to, and appropriation of European audiovisual digital cultural heritage. I also analyze and reflect on my engagement with a local cultural movement AvoinGLAM ("avoin" means "open" in Finnish, the acronym GLAM comes from Galleries, Libraries, Archives and Museums) advocating for open culture. Geographically, my research is somewhat Eurocentric as the cases and co-design experiments are conducted in European countries with European digital cultural heritage, and influenced by European Union (EU) funding mechanisms and agendas. The research was conducted as Participatory Design, where I have combined approaches from Action Research and Research through Design. I describe my research trajectory, research design and methodology in detail in Chapter 3.[9]

9 This multi-method approach has been earlier applied by other researchers in my home department, and my work continues a series of doctoral dissertations that carry out multidisciplinary and collaborative design research in diverse settings (see e.g. Díaz-Kommonen 2002, Salgado 2009, Leinonen 2010, Botero 2013, Saad-Sulonen 2014).

I explore and discuss possible strategies for collaborative infrastructuring, and interrogate how infrastructures and the conditions that surround them influence the process of constructing and contributing to cultural commons. Presenting insights and findings from the collaborative design efforts made in constructing the socio-material-technical and cultural infrastructures in the cases, the doctoral dissertation thus addresses the potentials, complexity and limits of infrastructuring for cultural commons. To analyze the three design research cases, I connect discussions and practices related to commons and the becoming of information infrastructures (Star 1999, Star and Ruhleder 1994, 1996). I make use of the theoretical concepts of installed base and gateway, both developed within studies on infrastructures. I also apply the notion of common-pool resources (CPR) as playing a role in a design strategy for co-constructing cultural commons, and propose a design orientation of 'commons design', building upon commons research but giving it a decisive designerly reformulation. Bringing these research perspectives and concepts together, I have formed an analytic frame for discussing the collaborative infrastructural work in my three design research case studies. This analytic framework applied in Chapter 5 is a combination of two accounts developed in research articles included in this dissertation (Article 5: Marttila 2016 and Article 6: Marttila and Botero 2017).

I situate the design cases in relation to the interest in advocating not only for preservation and access to digital cultural heritage, but more pressingly for the importance of enabling creative re-use in a variety of domains (e.g. civic action, learning, research). This links to contemporary discussions on the importance of creating and sustaining commons, and in particular, cultural commons. I discuss how technology systems for digital cultural heritage, and the conditions that surround them, participate in the construction of cultural commons. Through presenting some selected examples, I discuss how design can contribute to the infrastructuring of cultural commons, and shed light on the issues for professional designers that operate in open-ended and commons-based settings.

1.4 Summary of the cases and research articles

The six articles included in this dissertation address different aspects of the research area and research questions presented above through three design research cases, namely Case 1: Fusion, Case 2: EUscreen and Case 3: AvoinGLAM. Fusion was targeted at helping communities of practice to share and create community media, and EUscreen aimed to create a single access point for television programs coming from various European broadcasting corporations and audiovisual archives. Both of these projects were co-funded by the European Commission (EC), and involved multi-professional consortia from various European countries. The projects had multiple objectives and various research outcomes in different research domains. In my dissertation I focus on the collaborative and participatory design efforts that were a part of these long-term research initiatives, and aimed for designing information technologies and services for various user groups. The third case of my dissertation, AvoinGLAM, is an initiative that aimed to build a bridge between the two different kinds of actors that are central to my dissertation, namely official cultural heritage institutions and citizens. In the AvoinGLAM case, I draw on my four-year engagement with an open culture movement in Finland. The purpose of the case is to examine how participatory design processes can strengthen interaction and participation in commons-based frameworks, and how infrastructuring and commoning activities can support the emergence of cultural commons. The two earlier cases, Fusion and EUscreen, attempted to design technology platforms for legal creative re-use and open and/or public access to digitized audiovisual materials, and I found that such initiatives had their limitations. The findings from these cases pointed to the need for more collective and open-ended design orientations for approaching digital culture and digital cultural heritage. Fusion and EUscreen thus led me to the different approach taken in the AvoinGLAM case. Taken together, these three experiences provide me with a broad view of the infrastructuring challenges for digital cultural heritage, and point to a wide set of issues that, I will argue, are central to the emergence of cultural commons across time. I summarize the cases in Table 1, and elaborate them in Chapter 3.

Table 1. Overview of the design research cases of the doctoral dissertation.

	Case 1: Fusion	**Case 2: EUscreen**	**Case 3: AvoinGLAM**
Short description of unit of an analysis	The co-design process and design experiments of the Fusion design platform and Social Media Application Toolkit (SMAK)	The co-design process of the EUscreen portal. Design experiments devised to support and stimulate creative re-use of digital archival video materials.	The co-design and design experiments to support art and culture institutions' efforts to open part of their digital holdings, and to enable citizens to appropriate digital cultural heritage materials.
Context and framework	The design and research work was conducted in the context of the P2P-FUSION project 2006—2009 co-funded by the European Union. Seven partners from three different countries formed the consortium.	The design and research work was carried out in the context of the EUscreen project 2010—2012 co-funded by the European Union. Altogether 28 partners, largely audiovisual archives, from various EU countries formed the project consortium.	The focus of the analysis is during the initiation of the movement during 2012—2015 (the initiative is still ongoing). The AvoinGLAM was initiated within Aalto University ARTS, and later became a part of the Open Knowledge Finland association. Two projects under analysis in the doctoral work were funded by the Ministry of Culture and Education in Finland.
Co-design participants	Interdisciplinary project consortium, communities of practice, targeted user groups, external practitioners, designers and software developers, other stakeholders (e.g. teachers, experts).	Interdisciplinary project consortium, targeted user groups in education, research, leisure and open culture, heritage organizations, practitioners, artists, designers and software developers, other stakeholders (e.g. teachers).	Representatives from libraries, archives, museums and third sector organizations - creative practitioners, experts and amateurs alike. Open for everyone to participate.
Key co-design efforts and experiments	Co-design workshops with communities of practice SMAK Toys – a co-design game for co-design workshop Prototypes	Collaborative design workshops, hands-on and do-it-yourself events (e.g. remix video workshop, hack day) Design prototypes and experiments	Towards open culture co-design workshops Open cultural data Master Class Hack4FI – Hack your heritage! Open culture hackathon Open culture prototypes and concepts
Data collected	Documentation and analysis of co-design efforts and design experiments Semi-structured participant interviews and field observations Questionnaires and surveys	Documentation of co-design workshops and design efforts and prototypes Semi-structured participant interviews and field observations Questionnaires and surveys	Documentation of co-design workshops and other arrangements, participant and field observations, semi-structured interviews, questionnaires Common-pool resources and open culture datasets

	Case 1: Fusion	Case 2: EUscreen	Case 3: AvoinGLAM
My position and role(s)	Project lead, participatory designer and design researcher	Project lead of co-design efforts, participatory designer and researcher	Initiator of the AvoinGLAM network and working group, project design and principal investigator of the funding applications Academic activist and open culture practitioner
Original research articles presenting and analyzing the cases	1 & 6	3 & 6	5

The individual arguments in the articles are shaped by the scholarly context for which they were written, namely design research, PD, HCI and CSCW. The articles can be grouped in four different themes (some articles fit in two categories):

(1) Presenting the three co-design cases and understanding emerging media and social practices linked to digital culture and digital cultural heritage (Articles 1, 3 & 6).
(2) Documenting and discussing design strategies and solutions for digital culture and digital cultural heritage (Articles 3 & 6).
(3) Exploring and reviewing research literature on co-design of digital media and technology, and on commons, to base the development of theoretical foundations (Articles 4 & 5).
(4) Developing a framework for infrastructuring for cultural commons (Articles 5 & 6).

The articles are presented in detail in Chapter 5, in Table 2 on page 36 the original articles and their key findings and central concepts are listed.

1.5 Contributions and relevance of the research

This dissertation contributes to the discourse on infrastructuring in contemporary design research, especially in the fields of PD and CSCW, by presenting empirically grounded findings and proposals from the three design research cases. My doctoral research thus makes two key contributions:

As the first contribution, I develop **a theoretical framework that combines infrastructuring and commons**. By bringing these research perspectives together, and exploring some of their specific concepts, I form an analytic frame for discussing the collaborative infrastructural work in my case studies. The framework is then applied to address the tensions and dynamics of infrastructural development and infrastructural change for digital cultural heritage. Doing so allows me to further explore and use the concept of infrastructuring, nuancing and deepening its nexus with PD. The framework allows me to propose four infrastructuring strategies for cultural commons, namely: 1) probing and building upon the installed base, 2) stimulating and simulating design and use through gateways, 3) producing common-pool resources, and 4) fostering and shaping a commons culture that supports commoning. These strategies are presented and discussed in Chapter 5. Previous research has experimented with the application of infrastructuring and commons ideas in design research (for a review of this in PD see Karasti 2014, in CSCW see Pipek et al. 2017), and my work is in dialogue with and furthers this literature. In particular, I aim contribute to recent thinking that draws on conceptual tools surrounding the concept of the commons to better understand new modes of participation, production, and designing and commoning.

By connecting commons literature and research on information infrastructures and drawing on the practical design work conducted in the cases, I explore how some of the central issues to PD can be reconsidered to guide a future design research agenda. Thus, the second contribution of my doctoral work is that **I present initial principles for designers and researchers operating in commons-like frameworks, outlining what 'commons design' may look like**.

In addition to these key contributions, this doctoral dissertation offers nuanced understanding of the aspects of co-designing socio-technical information infrastructures for digital culture and cultural heritage, and highlights how conditions surrounding infrastructure influence the design. The findings serve two purposes:

First, the experiences deriving from the design research cases inform and verify multiple gaps between, on the one hand, the institutional and professional practices of digital cultural heritage, and on the other hand, the practices of appropriators. These emerge in the technological frameworks, standards and policies, through which access to shared resources and cultural production is managed, governed and provisioned, as well as in the practices through which people and institutions engage with digital cultural heritage. Secondly, in practical terms, my multiple explorations and experiments with *how* to collaboratively design for shared digital cultural heritage in more open and symmetrical terms, and how to bridge between the technology design and appropriation, describe new methods for PD. It contributes to the longstanding tradition of PD and its maturing principles and practices, and helps to articulate new methods and techniques for engaging people in design activities (cf. Schuler and Namioka 1993, Spinuzzi 2004, Robertson and Simonsen 2012).

In addition to the empirically grounded findings and proposals contained in the individual articles, put together, this dissertation contributes both practical implications and theoretical considerations useful for professional practice. The targeted audience of this dissertation is commoners, design researchers and practitioners working within PD, and professionals operating in the digital cultural heritage sector or applying PD or co-design methods.

1.6. Structure of the dissertation

The thesis begins by contextualizing the doctoral research by bringing together perspectives from relevant bodies of literature, in Chapter 2. I introduce the theoretical considerations and key terms, and link them to the three research areas relevant to this doctoral dissertation: Participatory Design, infrastructuring, and cultural commons. The purpose of this is to contextualize and frame the empirical work conducted in the case studies.

In Chapter 3, I present my research methodology and trajectory, and introduce the three design research case studies that form the empirical foundation of my doctoral research. In addition, I situate the cases in relation to digitalization and convergence of cultural heritage institutions in Europe. I position my design research activities and motivations in relation to openness and access. Furthermore,

I detail how the data was acquired according to the principles laid out in my research design.

In Chapter 4, I synthesize and summarize the six original research articles that form the main body of work conducted in this doctoral dissertation. I also highlight the aspects that are relevant to the research questions set out above, and foreground the contributions from the individual articles.

In Chapter 5, I return to the notions of commons and information infrastructures, and combine this theoretical framing with a discussion of infrastructuring to contextualize and reflect upon the empirical work conducted. As my key contribution, I present a set of infrastructuring strategies aiming at constructing and contributing to cultural commons. I combine the different conceptual and theoretical perspectives that have emerged during the research process to discuss requirements for professional media and interaction designers, and for the field of PD in general. I explore the contours of a design orientation that I term commons design, and it preliminary principles.

In the last chapter, Chapter 6, I conclude the dissertation by briefly summing up the results of my work and offering a few final remarks and thoughts on the implications of my study for future research. The original research articles are attached to this introductory chapter (see Appendix 1).

Purpose of the article	Name of the Publication	Key Findings
Setting the stage: Presenting and discussing the co-design cases and experiments and their key findings	Marttila, Sanna; Hyyppä, Kati and Kommonen, Kari-Hans (2011). **Co-Design of a Software Toolkit for Media Practices: P2P-Fusion Case Study**, New Media Technologies and User Empowerment. Jo Pierson, Enid Mante-Meijer and Eugène Loos (Eds.). Peter Lang - International Academic Publishers, USA.	**Forming co-design partnerships for real-life needs.** It is important to nurture the co-design approach in a wider multidisciplinary environment and concretize the value of each of the co-design partners' efforts. Timing of user involvement is crucial in the software development process. In addition, longer projects should be flexible to changing conditions of participants and adjust according to their current needs and resources. Participating people should have a real life need or a practice that they can contribute to the process, and naturally in return obtain relevant knowledge or experiences that contribute to their everyday. **Self-discovery and evolution of everyday media practices is key to co-design of software toolkit and system.** The case incorporated several co-design methods, tools and work practices. The use of low-fidelity design tools and paper prototypes in the ideation phase supported not only identifying needs and wishes of communities, but also creating a common language among the design partners. **Open access to design documents, resources and tools is pivotal to co-design partners.** One of the key insights of the co-design process was that the professional designers should provide access to resources and tools to encourage communities to share their experiences, knowledge or designs with their peers. **Co-design efforts should aim for openness and designability.** In our findings we conclude that despite of the challenges in engaging everyday people without programming skills to the co-design of technology infrastructures, it is important for designers and software developers to learn to design for openness and for designability. **Keywords and concepts:** Media practice, co-design, openness, designability, common resources.

Table 2. A summary of the original research publications and their key findings. The research articles are elaborated in Chapter 4, and are attached to this dissertation (Appendix 1).

Purpose of the article	Name of the Publication	Key Findings
Setting the stage: Presenting and discussing the co-design cases and experiments and their key findings	Marttila, Sanna & Hyyppä, Kati (2014b). **Rights to Remember? How Copyrights Complicate Media Design.** In Proceedings 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational (NordiCHI'14), ACM, Oct. 2014, pp. 481–490.	**Copyright issues are an overlooked factor in design of digital participation platforms** for audiovisual cultural heritage. Intellectual property issues influence both the design of technology platforms for digital cultural heritage and the selection of cultural content made available through these systems. **Design of experiments, workarounds and pilots for rehearsing desirable futures together.** Media design is limited by the copyright restrictions, and new design strategies are called for to meet the needs and wishes of diverse user groups. Design experiments, workarounds and pilot projects allow people to access and participate in environments that are not possible due to the legal frameworks or other limitations. **Politics of memory, and politics in design.** As designers we might think in terms of facilitating collaboration and co-creation, but at the same time we might be enacting and facilitating restrictive IPR regimes against people's existing media practices. Some memories and ways of remembering may become illegal due to unavoidable copyright infringements. We also note how digital media design projects dealing with cultural heritage risks re-introducing copyrights and endanger designing robust and sustainable cultural commons. **Keywords and concepts:** Media design, co-design, cultural heritage, copyrights
	Marttila, Sanna (2016). **From Rules in Use to Culture in Use – Commoning and Infrastructuring Practices in an Open Cultural Movement.** In Proceedings of the Design Research Society Conference 2016. Design + Research + Society. Future-Focused Thinking.	**Infrastructuring and commoning for infrastructural development and commons.** The article proposes that in co-design and commoning processes for cultural commons, we should work through infrastructuring a commons culture rather than mainly through designing legal and regulatory or technology infrastructures (e.g. licensing frameworks, web hosting services). The paper suggests that building on commoning principles, vocabularies and ideals that actors (organizations and individuals) can use to define their identities can be complementary to setting rules that external authorities would respect. Furthermore, the paper argues that an infrastructuring approach that works toward open cultural commons can thus not only build upon the traditional commoning principles of rules-in-use, but should be extended to encompass culture-in-use. **Creating shared knowledge bases and common resources strengthens construction of commons.** Shared and collectively maintained local information and knowledge resources encourage and support construction of global and open cultural commons. Practicing commoning in small-scale could lead to wider collective action and caring for cultural commons. **Participants in global cultural commons lack possibilities to take part in setting the rules and governance of common resources.** Commoning activities and cultural practices increasingly rely on digital platforms and social networking sites governed by often commercially motivated rules and laws that commoners have not been able to negotiate themselves. **Articulation of the dual role of the activist academic.** The paper articulates the intertwined role and experiences of a digital media designer and an open culture activist. It reflects on the tensions and social dilemmas that infrastructuring and commoning activities for cultural commons might bring to PD practice. **Keywords and concepts:** Cultural commons, infrastructuring, commoning, commons culture.

Purpose of the article	Name of the Publication	Key Findings
Developing analytical framework: Infrastructuring for cultural commons	Marttila, Sanna & Botero, Andrea (2017). **Infrastructuring for Cultural Commons.** Special Issue on Infrastucturing and Collaborative Design. In Computer Supported Cooperative Work (2017) 26: 97.	**Collaborative infrastructing for cultural commons.** The paper explores possible strategies for collective infrastructuring, and interrogates how infrastructures and the conditions that surround them can be instrumental in constructing and contributing to cultural commons. We situate our co-design activities and infrastructuring strategies in relation to a broader interest in advocating not only the preservation of and access to digital cultural heritage, but, more importantly, enabling collaboration, to support the emerging practices of diverse user groups, and to contribute to cultural commons. **Infrastructuring strategies for cultural commons: installed base and gateways.** We find that the notions of installed base and gateways originating from STS and infrastructure studies are useful in discussing the socio-technical infrastructural development required for digital audiovisual cultural heritage, and for identifying and orientating infrastructuring strategies and moves that could contribute to cultural commons. **Stimulating and simulating future infrastructural configurations.** Building on our cases we argue that creating socio-technical workarounds, ad-hoc arrangements and prototypes in order to simulate and stimulate the current and emerging practices is valuable for infrastructural development. Our experiences also point to the importance of building bridges between different actors and resources, as well as weaving together different contexts and practices as potential infrastructuring activities that could be beneficial to all involved stakeholders. These explorations have a specific role in enhancing technologies and practices, and further, in these staged instances, stakeholders have a possibility to collaboratively create common ground and build shared resources. If adequate, flexible gateways can be proposed during the infrastructural development, more cultural commons can emerge. **Keywords and concepts:** Cultural commons, infrastructuring, collective infrastructuring, commons culture, installed base, gateway.

Purpose of the article	Name of the Publication	Key Findings
Laying theoretical foundations: Towards open-ended co-design and commons design	Marttila Sanna & Botero Andrea (2013). **The 'Openness Turn' in Co-Design. From Usability, Sociability and Designability Towards Openness.** In: Co-create 2013, the boundary-crossing conference on Co-design in Innovation. Espoo, Finland: Aalto University. p. 99–110.	**Situating the 'Co' in Co-design.** Building upon both design research theory and practice, the article explores the evolving field of co-design, and aims to interrogate some of the antecedent and contemporary understandings of the field found in the literature. We propose that these different understandings are mediated by a series of 'turns' we identify as: usability, sociability and designability. Moreover we aim to illustrate how a fourth turn – openness – is entering the stage, and introduce the concept of commons as a way of reflecting on the future of co-design. **Connecting commons and peer- and commons-based production closer to the co-design approach.** Our main course of action was to look into the representative literature in areas that are shaping the discourse in co-design research and identifying the themes, interests, motivations and focus of each of them, and what this means for participants in co-design endeavors and their possibilities for influencing and negotiating issues like modes of governance and ownership. We advocate designers to learn from the implications and insights arising from the commons research and from commons-based and peer production, and link them closer to collaborative design efforts. **Keywords and concepts:** co-design, openness, commons, infrastructuring.
	Marttila Sanna; Botero Andrea & Saad-Sulonen, Joanna (2014) **Towards commons design in participatory design.** Proceeding PDC '14 Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium papers, and Keynote abstracts - Volume 2.	**What PD can learn from commons literature?** In the article we probe what the Participatory Design (PD) field can gain from exploring the literature on commons. Our brief overview shows that the commons discourse has connections with PD: 1) work on infrastructuring, 2) commoning as designing, and 3) contemporary design processes as 'design commons'. We argue that these findings from this body of knowledge can further PD practices and research when the field is increasingly situating itself from the workplace to broader community contexts and publics, in addition to aid PD to operate with and thrive within increasingly more complex design issues and contexts. We also suggest that in PD we might need to look at, understand and engage collectively in processes distributed more radically in space and time and within more complex socio-material assemblies than what has been done previously. **Keywords and concepts:** Commons, participatory design, infrastructuring, commoning.

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2. Theoretical foundations: participatory design, infrastructuring and cultural commons

The chapter sheds light on the field of Participatory Design and its shifts in focus and practice over time. In order to achieve this objective, I interrogate some of the antecedent and contemporary understandings found in the literature. This contextualization through selected literature allows me to situate my own research and design practice in the field. This chapter also introduces the theoretical considerations and the terminology of key research perspectives relevant to this doctoral research: *infrastructuring* and *cultural commons*, and casts light on the key contributions of these different bodies of knowledge. By bringing these research perspectives together, and by presenting some of their specific concepts, I am forming an analytic frame for discussing the collaborative infrastructural work in my three case studies. The framework is then used in Chapter 5 to address the tensions and dynamics of infrastructural development and infrastructural change for digital cultural heritage, and for identifying strategies that could contribute to cultural commons.

2.1 Towards open-ended participatory design

> "Participatory design has always given primacy to human action and people's rights to participate in the shaping of the worlds in which they act" Robertson and Simonsen (2012, p. 4).

The field of Participatory Design (PD) explores possibilities and conditions to enable user participation in the design of information systems and technologies. Since the 1970's PD has aimed at involving future users in the early design phase of computer-based systems with a democratic and political objective. At the time computers and technology systems were increasingly becoming an integral part of the working life of many. The PD projects in Scandinavia wished to increase the industrial workplace democracy by inviting the workers be directly part of the design processes — not only the management — and at the same time introduce new information technologies and develop practices through different tools and mechanisms (for overviews of the history and development of PD see e.g. Ehn and Kyng 1987, Robertson and Simonsen 2012).

In early PD literature three issues were particularly addressed: "the politics of design, the nature of participation, and methods, tools and techniques for carrying out design projects" (Kensing and Blomberg 1998, p. 167). Since these early decades of PD, the field has matured and changed, however these issues have been constant. Halskov and Hansen (2012) studied PD practices through scholarly contributions over ten years and echoed that participation remains a central issue for PD scholars in changing contexts of design. An important development has been that, partly due to digital convergence, PD has moved also beyond the work context, as people's everyday everywhere is shaped by information technologies and mediated through digital materials (Robertson and Simonsen 2012). The professional practice has moved from laboratories to everyday contexts in the "wild" — to the offices, homes and other domains of our private and public life. Consequently, this move had implications for design practice, which was increasingly "seen as continually on-going, and intricately interwoven with use" (Henderson and Kyng 1991, Dittrich et al. 2002). Their notion of design-in-use focused on the nexus between technology design and use. The need to understand users as user-designers broaden the tempo-

ral dimensions of ´use time´ and ´design time´, and their intertwined relation as design-in-use has inspired many scholars and their professional practices (Henderson and Kyng 1991, see also Floyd et. al. 2007, Ehn 2008, Redström 2006, 2008, Dittrich et al., 2002, Fischer 2011, Botero and Hyysalo 2013, Löwgren and Reimar 2012, 2013). Furthermore, scholars have extended the notion of design-in-use to discuss aspects of design-before-design and use-before-use (e.g. Redström 2008, Ehn 2008).

Participation is the bedrock of PD, and is enacted through social interaction of different parties ideating, innovating and creating things together (Robertson and Simonsen 2012). In design research, unfolding what participation and collaboration means in practice has been a quest for many, and co-design has come to mean a variety of things and activities: a collaborative learning process between designers and practitioners, a designerly effort to understand people in their situated practices and contexts (Suchman 1987, Ehn 1988), and an active involvement of 'end-users' in the cooperative design process of IT systems (Greenbaum and Kyng 1991), building upon the premises e.g. of user-centered design (Norman and Draper 1986) and Computer Supported Cooperative Work (CSCW).

A major shift in professional design practice happened when users' role in design changed from being merely an informant providing implications and ideas to the process, to rather being a rightful member of the design endeavor. From the beginning the PD approach has acknowledged people as experts in their own domain and have included and invited them to be part of the design processes (Schuler and Namioka 1993). As the movement advanced, scholars and practitioners have been seeking means to enrich and enable greater participation, and eventually confirmed that 'everybody designs' and constantly redesigns in their everyday (Bannon and Ehn 2012, Manzini 2015). Increasingly, design researchers have argued, and also reported through empirically grounded findings, how it us beneficial to braid together the users' domain with designers' domain and to develop "in-between spaces" and "in-between infrastructures" for collaboration (Muller 2002, Botero and Saad-Sulonen 2010). Furthermore, the technological advantages that have given people a new variety of possibilities to take part in design have expanded the design space and participants' abilities to explore it (Westerlund 2005, Botero et al. 2010). This evolution in collaboration and participation in design has also engendered a new vocabulary on the scopes of these endeavors. Ehn (2008) portrays design the object

as design "Things", as a process of "inquiring into the 'agency' of not only designers and users, but also of non-human 'actants' such as objects, artefacts and design devices" (Ehn 2008, p. 1, see also A.Telier 2011/Binder et al. 2011).

Stakeholders' participation in the design of ICT and IT systems has evolved significantly over time, as have the professional practices of co-design. Various attempts at classifying and articulating the evolution and diversity of co-design have been made (see e.g. Sanders and Stappers 2008, Mattelmäki and Visser 2011, Steen 2013) as well as at characterizing the advancements in fields of PD, HCI and CSCW (see e.g. Bødker and Iversen 2002, Bødker 2006, Bødker 2015, Halskov and Hansen 2015). In the Article 3 (Marttila and Botero 2013), my co-author and I have also proposed a framework for understanding co-design and its evolution over time. This call for reciting the different moves and their related practices was prompted by my practical design work in this doctoral project, and from a need to a build a conceptual grounding to situate and approach the challenges of the changing landscape of participation and collaboration in the more "messy", shared and commons-based settings of our contemporary, digital age. Previously, the PD community has identified a need to move beyond traditional project frame and embrace wider dimensions of design-use relations (Henderson and Kyng, 1991, Dittrich et al. 2002). Notions that have engaged with this demand in contemporary PD include publics (DiSalvo 2009, Lindström and Ståhl 2014, Teli et al. 2015), things (Ehn 2008, A. Telier 2011), community-based participatory design (DiSalvo et al. 2012, Le Dantec and Disalvo 2013) and infrastructuring (Björgvinsson et al., 2010, 2012a, 2012b). Yet, in PD discourse there has been little discussion about collective action that relies on and contributes to commons, and how professional PD practice could support, feed and sustain it.

Building upon design research theory and practice, Article 3 interrogates some of the selected preceding and contemporary understandings found in the fields of HCI, CSCW and PD. In this article we argue that these different

understandings are mediated by a series of 'turns'[10] that we refer to as: usability, sociability, designability, and finally underscore how the turn to openness and commons is entering the stage. The article calls attention to the notion of commons as a way of reflecting on the possibilities of participants to influence and negotiate issues e.g. related to terms of collaboration, ownership, and governance.

The series of turns that have shaped co-design thinking, a key takeaway from the article, are useful in contextualizing my doctoral project as a whole: By the "usability turn" we refer to the practices of professional designers whose focus has a clear emphasis on use and use situations. This turn has provided impulse to the User Centred Design (UCD) movement and constitutes much of the basis of research and literature in the Human Computer Interaction field (HCI) (Grudin 1990, 2012), particularly the phases referred as 1st and 2nd wave of HCI (see e.g. Bødker 2006, Harrison et. al 2007). HCI emerged as a multidisciplinary field to acknowledge human factors in engineering and aspects of cognitive science in the beginning of the 1980s. Throughout the decades it has moved beyond the terminal and desktop, and shifted "from human factors to human actors" (Bannon 1991) and from laboratory research to real-life settings (accounts of the evolvement and history of HCI see e.g. Rogers 2012, Grudin 2012). Although the understanding of the use situation expanded already in the beginning of the era of personal computers, the collaboration and interaction with people remained rigid with formal guidelines and proceedings, evaluation methods (e.g. user testing) and standards. This turn is characterized by an interest in scientific measurement and evaluation of use and usability (see e.g. Dumas and Redish 1993 Human-Centred Design ISO-1999) deemed necessary when people other than trained technical professionals began to use computer systems (Kuutti 2009).

What we refer to as the "sociability turn" encompasses efforts that explicitly recognize and address the social aspects of both design work and of use. Issues

10 Here the term evolution is used in a permissive way, when combining evolution with turns underscores that each turn builds upon the previous ones, re-orienting the field without replacing or overriding completely what is already there. This combination has the advantage of implying a historicity of the field, what is lacking in those frameworks that simply map different approaches, and avoiding the determinism of paradigm shifts.

around this second turn can be recognized mostly in literature around the Participatory Design (PD) movement (e.g. Greenbaum and Kyng 1991, Simonsen and Robertson 2012), the Computer Supported Cooperative Work field (CSCW), and in the HCI literature dealing with third wave concerns (Bødker 2006, Harrison et al. 2011). The sociality turn literature sees design collaboration mainly as enacted through organized events and experiments initiated by experts and thinking of users as stakeholders that form partnerships with professional designers (Sanders and Stappers 2008). These co-design contributions, however, are usually situated in the ideation or conceptual design phase (Sanders and Stappers 2008, Botero and Hyysalo 2013). It is important to note that when focus shifted from HCI to also to people interacting with each other mediated through media, devices and networks, new areas of design emerged (Bannon 2011). For example, online participation platforms and social networking sites require novel designs to guide use, design-in-use (policies such as terms of use, copyright agreements) and participation (community guidelines, access management mechanisms), in addition to foster cooperation and creative actions by people (e.g. good practices).

In the third turn, which we call the "designability turn", we move towards design work that is attentive to the design needs of contributors, even 'end-users' and appropriators themselves. Scholars have formulated conceptualization, created design approaches and tools for how professional designers could feed and support design-in-use and address possible barriers of collaboration. Issues relevant to designability have been raised in the literature such as in CSCW and PD (e.g. Büscher et al. 2001, Harstwood 2002. Törpel et al. 2009, Kanstrup 2012), design research in general (Krippendorff 2005), interaction design and HCI (Löwgren and Reimer 2012, 2013) and in what has been termed the End-User Development (EUD) approach (Lieberman et al. 2006). One strategy is Meta-Design, which refers to the creation of social and technical infrastructures to enable novel forms of participation, design and development (Fischer and Giaccardi 2004). Here users are seen as potential designers who are extending, improving and appropriating designs. The designability turn thus implies bridging participatory activities towards evolving life contexts (Fisher and Scarff 2002, Fischer and Giaccardi 2004, Saad-Sulonen et al. 2012) in the frame of 'cultures of participation' (Fischer 2009), which are supported by various technological environments and digital tools with an aim to contribute to "collaboration among users acting as active contributors and designers" and to enable systems to be develop in real-time use (Fischer 2011).

One notable effort, and one relevant for my dissertation, is the effort to combine design, media and participation, shown in the work on "collaborative media" by Löwgren and Reimer. Drawing from both interaction design theory and media studies, they develop a notion of an "emerging cultural form" — collaborative media — that depicts the change of former audiences and consumers becoming creators and producers in the media landscape, and them taking part in designing and shaping the technology and systems that the continuous media materials rely on (Löwgren and Reimer 2012, 2013). They envision that designing collaborative media will lead to abandonment of the defined and limited design process and allow "ongoing infrastructuring where design melts together with production and consumption" (Löwgren and Reimer 2012, p. 40).

For the fourth turn we identify in Article 3 (Marttila and Botero 2013), we propose a turn to openness and commons. Often the notion of 'open-endedness' is embedded in the co-design or PD practice. Nevertheless, it was only fairly recently that the notion of "open" was introduced to design practice and research (Aitamurto et al. 2015). Two main strands can be identified in the practice and literature on open design: first, a predominant one focusing on design artefacts where the emphasis is put on the openness of publicly available designs (e.g. blueprints, design resources) (see Abel et al. 2011). The other strand is focusing on open-ended design activity and practice. This second notion of openness is indicated in PD research calling for design engagement as infrastructuring (Björgvisson et al. 2010, 2012a, Bucher et al. 2009, Star and Bowker 2002) and in Community-based Participatory Design (DiSalvo et al. 2012), although without addressing the notion of openness straight on.

As PD has shifted focus towards messy and communal everyday life settings, and operates increasingly in commons-based frameworks of collective action, it could be beneficial to continue to build upon modes and characteristics of continuous and open-ended commons-based and peer-to-peer production (cf. Benkler 2002, 2006, Bauwens 2009, Bruns 2008), and the concept of commons could be connected much more to Participatory Design and co-design efforts. The challenge and opportunity for PD and co-design approaches is, as I see it, to support and nurture collective action in ways that respect and accommodate the various contributions and skills of participants that strengthen the commons, in which individuals do not have "exclusive control over the use and disposition of any particular resource" (Benkler 2006, p. 61).

In this section, I have aimed to cast light on the research trajectory of PD, CSCW and HCI in relation to participation and co-design, to situate my design practices. Table 3 next page summarizes the main points of each turn to allow for comparison and reflection. The table is an iteration of the original table published in Article 3. In the sections that follow, I will provide theoretical grounds for the notions of infrastructuring and commons, in order to later propose infrastructuring strategies for cultural commons for Participatory Design.

2.2 Building on the notions of information infrastructures and infrastructuring

Research in Science and Technology Studies (STS) and Information Science (IS) has a long-standing interest in studying infrastructures and their characteristics. Studies within these fields address socio-technical issues of the design and use and the nurturing of infrastructures in both local and what they call 'global' settings (Bowker et al. 2010). Infrastructure studies are "a growing body of evidence pointing to patterns or dynamics common to the development of many infrastructures over many times and places" (Jackson et al. 2007). These bodies of knowledge offer me a vocabulary and concepts that I will apply in my analysis of the design research cases, and provide valuable insights on tensions, dilemmas and possibilities of infrastructural development.

Two intellectual traditions of studies on infrastructures, how they form and evolve, can be traced: the early one, developed since the 1980s, focused on historical perspectives of Large Technical Systems (LTS) such as the evolution of electric power (Mayantz and Hughes 1988), and building on this model, other similar research emerged studying infrastructures such as railroads and telephone networks. In these studies, the novelty was the shift of analytical focus, from individual devices and tools to large-scale systems (Edwards et al. 2007). The beginning of the second, later, tradition can be traced to the seminal work by Star and Ruhleder (1994, 1996). They did not focus on an individual technology system or "artefact", as did the earlier studies, but focused instead on relational and contextual aspects of *information infrastructures*, and furthermore considered the situated actions of people in infrastructural development. To clarify the difference, with an "informa-

Table 3. Summary of turns in co-design. The original table is published in Article 3: Marttila and Botero 2013.

Turns	**Usability**	**Sociability**	**Designability**	**Commons**
Design Frameworks	Human-Computer Interaction (HCI) (1st and 2nd wave)	Participatory Design (PD) HCI (3rd wave) Computer-Supported Cooperative Work (CSCW)	Meta-design End-User Development (EUD) Collaborative media design	Open Design Open Production Community-based Participatory Design
Main objective	Representing use Understanding task flows	Observing use Simulating use Understanding practices and experiences	Stimulating, simulating and triggering use environments	Design for collective action Infrastructuring
Object of co-design	Product	Practice Community	Toolkits Technology System	Ecologies Infrastructures Commons Things Social systems
What users do?	Adapting Misusing	Exploring Rethinking	Extending Improving Appropriating Remixing	Reinventing Remixing Forking Commoning
Who collaborates?	Expert team (One-shot events by invitation)	Expanded team (pre-defined process)	Expanded team, community (open-ended)	Peers (on going-long term commitment)
Relationship between collaborators	Individuals - Designers reach out to users - Users are informants and are in need of representation	Partners - Designers facilitate and stage events and experiments - Users are stakeholders	Communities - Designers provide tools - Users are potential lead users and experts	Collectives - Designers contribute to commons together with other commoners
Through what is collaboration enacted?	Personas Scenarios Flow-charts	Prototypes (paper, functional) Thick descriptions of practice Workshops, games Probes	Building blocks Platforms Toolkits Hacks	Common-pool resources Design Repositories Documentation Forks and Spin-offs
Modes of production	Mass production, industrial manufacturing	Mass and social production	Mass Customization, personalization and tailoring	Commons based, peer-to-peer, and social production

tion artefact" they refer to any of "a wide array of tools, system, interfaces and devices for storing, tracking, displaying and retrieving information" (Star et al. 2003, p. 244). The distinction between an artefact and infrastructure is found mainly in the relational aspect (Star and Ruhleder 1996) that becomes apparent when we consider how artefacts merge and align with human actors and how social practices emerge in an infrastructure or system.

Star and Ruhleder (1996) defined infrastructures as having a certain set of properties: One of them is that infrastructures are "learned as part of membership," and new participants need to get familiar with their artefacts and practices and undergo a process of initiation in order to function as a member. These 'links with conventions of practice' are crucial for infrastructural work, as it is how infrastructures form and in turn shape the practices, rituals and conventions of their members. Infrastructures are built upon the 'installed base' of earlier infrastructures, and therefore inherit both the resilience and weaknesses of that base. "Embeddedness" is another aspect, which refers to that socio-technical structures and materials become 'transparent' and invisible to the users that embed them in their practices and actions. They become visible only due to breakdowns. Infrastructure also has grown from being one isolated endeavor, event or human practice to a longer-term activity, either in place or in time (spatially or temporally). An infrastructure is modulated, that is, it "is fixed in modular increments, not all at once or globally" and "embody standards" by connecting to other systems (e.g. metadata standard, categories) (Star and Ruhleder 1996, p. 113, Star 1999).

As a term, infrastructure has both colloquial and professional meanings, and escapes clear definitions. To put it a bit vaguely but hopefully simply, infrastructures enable, support and foster human and non-human actions. These designed, built or composed common-purpose structures can include technologies, social and cultural arrangements. Infrastructures are sort of entities that carry, connect and transport other 'things', in the way that a road, a bridge or a wire does. Like wires and bridges, when infrastructures are mature enough to become invisible for their users and disappear into the background (Star 1999). Therefore, people are rarely aware of, or need to pay attention to, the complex system of interconnected socio-material-technical-cultural elements that are required for infrastructures to operate. These elements can include e.g. hardware and software components, standards and formats, protocols and policies, social practices and rituals. Suchman (2002) has discussed "artful integrations" as hybrid systems combining people, objects

and technologies. In connection to this notion, it is important to underline, in the context of my research, that infrastructures do not exist in isolation, nor are they neutral or necessarily democratic – they carry values, and enable some human and non-human activities and inhibit others (Slota and Bowker 2016).

The term "information infrastructure" refers loosely to digital technologies, services and resources linked with the Internet, and to the people and practices that inhabit the system and makes it part of society. This reframing became crucial when infrastructure studies began to focus on Information and Communication Technologies (ICT) and the Internet, and to engage and explore the novel forms of sociality, value systems and knowledge production that emerged with it (Bowker et al. 2010). This more holistic and horizontal approach to infrastructure studies and infrastructural development pays more sustained attention to organizational, legal, financial and promotional aspects of infrastructures (Edwards et al. 2007, p. 8, Bowker et al. 2010). Rather than being designed or deliberately developed, "infrastructures are ecologies or complex adaptive systems; they consist of numerous systems, each with unique origins and goals, which are made to interoperate by means of standards, socket layers, social practices, norms, and individual behaviors that smooth out the connections among them." (Edwards et al. 2013, p. 5). Characteristically information infrastructures are also open to various types of users and somewhat malleable to suit their agendas (Monteiro et al. 2013). I have employed the term information infrastructure to discuss and address the three design research cases for digital culture and cultural heritage.

Building upon the relational aspects of infrastructure studies, scholars have also proposed that infrastructures are not merely substrates that disappear or things that are built and then left behind. Instead, infrastructures are constantly in a process of (re)negotiation, in constant flux and *becoming* (Neumann and Star 1996, Star and Bowker 2002, Karasti 2014). Therefore, it is critical to trace backwards and forwards the relations and interdependencies that are created between humans, materials and structures at all levels (Star and Ruhleder 1996). To trace the implications of this relational and situated view more accurately, Star and Bowker (2002) suggests that it is more relevant and interesting to ask 'when' something is being perceived as an infrastructure by its users, rather than 'what' an infrastructure is. They also encourage to study infrastructures 'in-the-making' rather than after the fact (Star and Bowker 2002). When introducing the theme to the Participatory Design community, Neumann and Star (1996) asserted that through PD

techniques and principles it could possible to bring issues related to use to the surface. This process of "going backstage" and foregrounding aspects from the shadows, is key in understanding the tensions and dilemmas between the technology system and its users and their complex practices that are not often 'articulated' (i.e. tacit knowledge) (Star 1999) or are embedded in 'communities of practice', which can form across formal organizations (Lave and Wenger 1991, 1998).

Scholars in STS and IS traditions have identified some key tensions that make infrastructural development more difficult, These include: *time*, e.g. short term endeavors versus long-term commitment, *scale,* e.g. accommodating local needs versus striving for worldwide interoperability, *agency*, e.g. planned processes and actions versus spontaneous and emerging change (Edwards et al. 2007). Many studies have addressed these issues, both from the practitioner side and coming from historical perspectives. However, Edwards et al. (2007) uncover "frequent disconnects between such "design-centric" and "user-centric" visions of infrastructural development." These disconnections include tensions between the designers and the users caused by differences between user expectations on one hand and the suppositions made by designers on the other, resulting in discrepancy in design and use that could lead to resistance or even abandonment of infrastructures (Edwards et al. 2007, p. 28). Evidently, through design approaches and design choices infrastructures can structurally include or exclude people and choose (not) to accommodate certain practices. New skills and competences are required from professionals involved in infrastructural development in addition to those already identified - e.g. "boundary work" is considered crucial in infrastructural development. This notion of boundary work refers to the creation and maintenance of "boundary objects" (cf. Star and Grisemer 1989) to "balance between different categories and meanings", and in "developing and maintaining coherence across intersecting communities" (Bowker and Star 1999, p. 297). To infrastructure means working with boundaries; managing and aligning different interests and groups; and bridging incompatible parts and artefacts.

2.2.1 Infrastructuring

Approaches emphasizing relational and long-term aspects of infrastructures have turned to the verb form of the term infrastructure, 'to infrastructure', or "infrastructur*ing*" (Star and Bowker 2002, Karasti and Syrjänen 2004, Karasti and Baker

2004). Seeing infrastructural work and design as infrastructuring (Karasti and Syrjänen, 2004, Karasti and Baker, 2004) has stemmed from the importance of drawing attention to *when* and *how* infrastructures become and *for whom* rather than *what* an infrastructure is, and to the on-going, flexible and open characteristics of the activity (Star and Ruhleder 1995, see also Star and Bowker, 2002, 2006, Ehn 2008, Karasti 2014).

In the early phase of defining infrastructuring, in relation to the making and management of information infrastructures, the term infrastructuring has been articulated as "an ongoing design process that highlights participation and co-construction, as well as the complex relationships between the long-term, data, participants, collaborations, information systems, and infrastructure" (Karasti and Baker 2004, p. 1). Considering design as infrastructuring shifts the focus of design from a particular information artefact or a single project outcome to the conditions surrounding infrastructures (Pipek and Wulf 2009). Doing infrastructuring work becomes a continuous effort — before, after and during use and infrastructural development — of constructing, facilitating and maintaining these complex socio-material-technical conditions, configurations and relations, forming alliances and aligning interests and concerns (Karasti and Syrjänen 2004, Björgvinsson et al. 2010). Design approaches arguing in terms of infrastructuring thus attempt to create conditions for future design and creativity to emerge and flourish among participants engaged with a collective issue (Le Dantec and DiSalvo, 2013). Sometimes these collective issues are controversial, although negotiations between different actors do not always need to reach or approach consensus (Björgvinsson et al. 2012a).

Increasingly, the concept of infrastructuring is explored within the field of Participatory Design. In a literature review Karasti (2014) traces how the PD community has applied the notion of infrastructuring and the understanding of information infrastructure (derived from the work e.g. of Neumann and Star 1996, Star and Ruhleder 1996, and Star and Bowker 2002). In the review, Karasti analyses and categorizes various PD approaches to and processes in infrastructuring design. She structures the use of infrastructuring mainly in two different contexts, in relation to workplaces and in relation to non-professional community projects. Karasti dates the adoption of the notion of infrastructu*ring* in PD to the article "Artful infrastructuring" (Karasti and Syrjänen 2004), in which the very term was coined. Here, attention was given to the interrelated and hybrid characteristics

of infrastructures, building upon Suchman's notion of "artful integrations" (2002). Thus, the stress is on the "processual, ongoing quality of infrastructuring activities". Infrastructure is considered as unfolding over a long period of time, and the aim of the designer's infrastructuring activities is to advance community interests, and support communities to "grow" the infrastructures they inhabit. Collaborative assembling, integrating and negotiating a myriad of actors, tasks, processes and practices was considered key for infrastructuring activities, requiring long-term commitment to and nurturing of the infrastructure, and giving rise to discussions about accountability towards the infrastructure (Karasti and Baker 2004, Karasti and Syrjänen 2004, Karasti and Baker 2008). Considering the relational and temporal qualities of an infrastructure, Karasti and her collaborators suggested that designers pay more sustained attention to the "becoming" of an infrastructure. In doing so, they put forward a notion of "continuing design" by taking a critical view upon the dichotomy bewteen "project time" and "infrastructure time" in an infrastructural development. This thinking aims at furthering a concept of "continuing design in use" (Henderson and Kyng 1991). Use and design are considered intertwined and multifaceted activities that are continuously carried out in everyday practices of e.g. appropriation, configuring, and maintaining the infrastructure.

Karasti connects the tradition of studying infrastructuring in the workplace context to the article by Pipek and Wulf (2009), where the authors discuss how to aid and support collaborative designing, and how to contribute to infrastructural design and "infrastructural improvement" in the work environment. The point of departure is to acknowledge the multi-level abilities and skills of workers contributing to the ongoing design process related to technology infrastructure in the work environment. Thus, infrastructuring becomes a means of supporting individuals in their pursuits. Hence, Pipek and Wulf (2009) employ the term infrastructuring to take distance from professional designers and "professionalized design activities", and to advocate for a broader understanding of user participation in the development of information technology infrastructures. They distinguish between two different modes of infrastructuring in the work context: One encompasses "all creative activities leading to the improvement of an individual's or an organization's own work practice", while the other encompasses activities that "contribute to the improvement of somebody else's (individual or organizational) work practice" (p. 457). Pipek and Wulf identify these "points of infrastructure" as occasions when infrastructure becomes visible during breakdown (cf. Star and Ruhleder

1996) or when local innovations and creative activities, such as modifications, tailoring, appropriation, emerge (Pipek and Wulf 2009).

Increasingly, PD has moved beyond the work context to more open socio-technical constellations and heterogeneous relationships than those found in the traditional organizations. Searching for new approaches to operate in this environment, scholars have bound together the use of the notion of infrastructuring with concepts such as things, publics, and commons. These approaches to infrastructuring, according to Karasti, share an interest of "retaining the original democratic ideals" of PD (Karasti 2014, p. 143). Studying infrastructuring in community context, Karasti locates three different approaches: infrastructuring design things, publics and commons. With similar aims as both Karasti and colleagues, and Pipek and Wulf, Ehn and his collaborators (Ehn 2008, Björgvinsson et al. 2010, 2012a, Hillgren et al. 2011) are interested in extending the focus and locus of participation in design. Their proposal and framing is participation in "design things" (rather than objects or systems), and through their participatory design endeavors they have suggested varying strategies and approaches for infrastructuring. Infrastructuring "things" was first introduced by Ehn (2008), who considers infrastructuring as a way of bringing the "design-games of designers and future designers/users together (metadesign)" (Ehn 2008, p. 2). (Here Ehn uses the term design-game instead of more traditional PD design project or process, alluding to Wittgenstein's famous concept of 'language games' that invigorated the study of language by making explicit its social dimension). Infrastructuring is considered as a means of extending design towards more on-going, open-ended and long-term commitments by diverse participants, and of enabling fluid processes of allocation of resources and alignment of actors (Björgvinsson et al. 2010, 2012a). In practice, infrastructuring could mean mediating and "matchmaking" between various interests, actors and activities (Hillgren et al. 2011).

The idea of infrastructuring publics is discussed by Le Dantec and DiSalvo (2013) as a PD approach to engage in issue-driven community contexts and address the dynamics, tensions and dependencies that are important to the constitution of publics. In their framing of infrastructuring they are building upon considerations from the "infrastructuring things" research but with an aim support forming of publics (cf. Dewey 1927). These authors consider infrastructuring a particular PD approach and practice, and define it as the "work of creating socio-technical resources that intentionally enable adoption and appropriation be-

yond the initial scope of the design, a process that might include participants not present during the initial design (Le Dantec and DiSalvo, 2013, p. 247). Karasti situates the work of Le Dantec and DiSalvo in realm of a community, although she notes that infrastructuring publics has been carried out in a wider "societal scale" and for broad publics that do not necessarily consider themselves communities. As an example of such a sphere, Karasti brings forward the work of Clement et al. (2012) on participatory experiments and research interventions in relation to drivers' licenses, what the authors themselves call "identity infrastructures". In Karasti's view, their work "shows how PD-inspired design interventions that integrate social/political critique can begin to open up possibilities for infrastructural reform" (p. 145).

In her review article, Karasti anchors the emerging infrastructuring commons approach in PD to some of the early work of my doctoral project (Marttila et al. 2013) and to an influential paper by Björgvinsson (2014). In my work on infrastructuring commons, the aim has been to connect the concept of commons, understood as socially arranged and shared resources (cf. Ostrom 1990, Hess and Ostrom 2007), to infrastructuring. In Björgvinsson's work on open and distributed innovation in relation to Swedish digital film distribution platforms, infrastructuring is described as open-ended collaborative production and "future-making" (Karasti 2014, Björgvinsson 2014). For Björgvinsson "[i]nfrastructuring means the negotiation and sociomaterial configuration of how local needs can be adjusted and aligned to shared needs" (Björgvinsson 2014, p. 190). Infrastructuring focuses on issues rather than projects, and central facets of the work are: long-term commitment, building shared understanding and trust among various actors, and connecting people not only with tools and resources but, more importantly, with skillful and capable experts (Björgvinsson 2014, p. 216—217).

As discussed above, scholars in PD have applied broadly similar approaches to infrastructuring, however there are differences in framing. In extending the conceptualization of what can be designed from artefact to infrastructure and "Things"; stretching spatial and temporal dimensions of design (i.e. intertwined design-in-use, design-before-design practices) as well as which activities are considered as design (e.g. appropriation, maintenance), the emerging infrastructuring research agenda is providing a new direction and framing to contemporary design research and PD. My take on infrastructuring follows and builds specifically upon the work of Björgvinsson and his colleagues (Björgvinsson et al. 2010, 2012a,

Björgvinsson 2014). The abovementioned considerations have influenced the configurations of the infrastructuring activities I have undertaken to further develop the 'infrastructuring commons' approach and its strategies in this doctoral dissertation. In my work, the infrastructuring processes have gradually become more open and flexible, a point that I elaborate in Chapter 5.

2.2.2 Two notions of a growing infrastructure: installed base and gateway

In addition to the notion of infrastructuring, *installed base* and *gateways* are two other concepts originating from information infrastructure studies that are important to my research as they provide me with the conceptual tools to reflect on the empirical design research cases of this doctoral dissertation. I make use of these interrelated notions as vehicles with which to further collaborative infrastructural development aiming for commons arrangements.

As characterized by Star and Ruhleder (1996, Star 1999), and further elaborated by e.g. Pipek and Wulf (2009), information infrastructures are always rooted in other social and technological infrastructures. This means that there is what these authors term an *installed base* for any given infrastructure. An emerging infrastructure is always building upon already existing prior foundations and it "inherits strengths and limitations from those bases" (Star and Ruhleder 1996, p.113). These installed bases can be technological, but they can also consist of social arrangements and practices. Given the presence of installed bases, any new part added or new whole contributed will inherit some strengths and weaknesses from them. According to Neumann and Star (1996), infrastructure building is also different from building other self-contained systems, in that doing infrastructuring requires linking many communities (already rooted in their own installed bases) into a larger network. Infrastructuring work thus requires that this larger network be made into an active participant, something that in turn inevitably results in various technical and social interdependencies (Neumann and Star 1996).

Empirical research on how infrastructures can emerge through infrastructuring has pointed out that such continuous-alignment processes are partly mediated by what is referred as gateways (Jackson et al. 2007). Gateways usually refer to assemblages and technologies that allow linking and bridging otherwise incompatible or disparate socio-technical infrastructures and practices. Most commonly, recog-

nized gateways are technical appliances or interfaces that connect separate systems, networks or programs together (David and Bunn 1988). However, as pointed out by Edwards et al. (2009) and Jackson et al. (2007), gateways should not be considered solely as technologies, but gateways can also be social solutions, or combination of both. This is illustrated for example by the case of standards, which need to be integrated all into organizations and into the everyday lives of the people who use those standards, and thus develop new practices that act as gateways, too (Edwards et al. 2009). Organizations can also act as gateways and play an important role in mediating between systems and actors (Zimmerman and Finholt 2007). In a way gateways act as intermediaries from one context to another.

From a design point of view, gateway-like effects can sometimes be achieved by setting up in-between infrastructures (Botero and Saad-Sulonen 2010). The concept of an in-between infrastructure understood in the context of my research denotes interventions and arrangements that enable experimentation among heterogeneous systems and with different actors *before* an actual infrastructure or its associated future practices have been achieved. In-between infrastructures thus can be seen as temporary arrangements and socio-material configurations, embedded in and emergent from a collaborative, or at least multi-user/multi-site, context that requires making provisional structures in order to move towards either more complete, more workable, or more formalized infrastructures. They allow those involved to rehearse future practices, and offer possibilities for understanding what the actual infrastructural initiative could require.

In addition to infrastructuring, the notions of installed base and gateway are highly relevant to infrastructural work for digital cultural heritage. Previous infrastructures provide an installed base that will influence a new development, and at the same time provide direction for designers and other participants of the efforts needed. Gateways, in turn, allow experimenting with the becoming of infrastructures. In bringing these two concepts into the PD and infrastructuring discussion, I contribute not only an argument for the usefulness of the concepts, but also considerations of their significance and their role in the design and research process.

Information infrastructures and infrastructuring are the first research agenda that inform my research, by making visible the conditions and processes that sustain collective action and make possible the emergence of common and shared resources. Next, I turn to the second research tradition at the heart of my research, commons and cultural commons.

2.3 Building on the notions of cultural commons and commoning

Commons are often characterized as natural and cultural resources that all parties involved have a shared interest in. Public property has longstanding history in the western world and in our legal and economic thinking and theory (Wall 2014). Commons-related research has a long established multidisciplinary tradition that at its core is interested in the question of rights to common and public resources, as well as in the characteristics of these common arrangements, and how these 'public property' schemas are organized and governed. The underlying question is whether the resources in question should be managed through a private property regime or a public access regime. The standard view in neoclassical economics is that there are two property regimes, either the property is in the possession of private actors or organized by the state (Rose 1986). In contrast to this view, commons and common-pool resources are sometimes seen as an arrangement and solution between the market and the state (Ostrom 1990), or as a new alternative going beyond them (Bollier and Helfrich 2012). Opposite to commons is thus the economic liberalism that divides goods and resources into either 'private goods' or 'public goods'. This ideology holds that management of resources and access to them should be carried out and decided upon by either individuals, companies or the state – not by collectives or through common property arrangements (Benkler 2013). Before introducing selected examples of the commons literature that are especially important to my research, it is necessary to highlight the difference between two core notions found from the commons literature: the difference between commons as a resource or a resource system (a.k.a. common-pool resources, CPR), and commons as a property-rights regime (e.g. legal/regulatory regime). To underscore, the latter is not a shared resource but a form and arrangement of ownership. The question is whether the use of the resource is open for all (public/open commons), managed and governed through collective action (common-pool resources) or limited to a pre-defined group or individuals (e.g. club model, housing association). Hess and Ostrom (2007) have defined commons as *not* in relation to goods or property regime but rather as "resources shared by a group of people" (p.

4).[11] A second clarification that needs to be highlighted is the difference between 'open' and 'regulated access'. In everyday contexts 'open access' is often confused with 'common property' and 'common resource' or commons, yet these terms do not carry the same meaning (cf. Hess and Ostrom 2008, Benkler 2013). Open access arrangements typify free unlimited and unrestricted access to resources, these include for example public parks and roads, and in my field public domain knowledge and culture. In turn, in common ownership or property schema, access and use of resources could require permission, payments and would be governed by a set of rules. Yet, open access commons is an arrangement of its own. Benkler defines open access commons to include "symmetric use privileges for an open, undefined set of users in general public" (Benkler 2017, p. 256).

2.3.1 Different commons research traditions

Broadly speaking, it is possible to identify three different research approaches to commons. The first is research on traditional commons and mainly focuses on understanding the role of institutional arrangements in sustaining and managing natural resources in various sectors. The second line of research on commons focuses on the study of information/knowledge commons; these intangible and immaterial commons are characterized by the networked knowledge generation and management and is especially visible on the Internet. The third and most recent strand of research can be located within the activist/practitioner movement, and it considers commons as a vehicle for social change and more democratic forms of governance (see e.g. Helfrich and Bollier 2012, Bauwens 2006, 2009). Each of these research traditions brings forward different aspects of commons that are relevant to my research, which I will explore in the following paragraphs.

The study of commons stems from the research on natural resources and the social-material practices and dynamics related to regulating them. This research

11 The term 'commons' is contested and there is no consensus over the concept (Wall 2014). The same applies to the concept of 'property' especially in the context of economics discourse. For example Rose states that "public property" is an oxymoron: things left open to the public are not property at all, but rather its antithesis." Public access to a resource such a waterfront turns them to "commons", individuals making use of it do not have any reason to buy the land or share of it (Rose 1986, p. 712, 716).

tradition has documented several ways in which communities and collectives form around a set of Common-Pool Resources (CPR), which traditionally have been linked to pasture lands, forests, fishing grounds. Around these resources, institutions and means of collectively managing and governing them have developed (Ostrom 1990). Commons arrangements are in this perspective thus ways of caring for and sometimes earning a living from a CPR in a sustainable manner without depleting the shared resources. Usually in CPR arrangements groups or community members have regulated access to the resources. Although the particular arrangements for each commons are unique, they in general fall outside better-known private or public-property strategies. Because governing a successful and sustainable CPR is not a straightforward endeavor, commons, (according to this research tradition), are described as a governance regime for shared resources that are vulnerable to social dilemmas (Ostrom 1990, Ostrom and Hess 2007). Potential problems in relation to the collective access to natural resource commons are often located in free-riding dilemmas and overuse/over consumption of shared resources. Hardin (1968) has formulated this tension as the "tragedy of the commons" in which, in a common resource arrangement, individuals are prioritizing their self-interest over the common good. This results in individuals overexploiting or damaging the shared resources, thereby preventing others from benefiting them, and by depleting the resources preventing themselves from future enjoyment of the commons. For Hardin, the implication is therefore straightforward and negative: "Freedom in a commons brings ruin to all" (Hardin 1968, p. 1244). Many scholars have since developed counter-arguments to Hardin's well-known tragedy of the commons allegory. Most notably among these is Ostrom (1990), who conducted an empirical study over 80 common-pool resource systems. Ostrom argues that under some circumstances collective management resources arrangements can be sustainable, and she identified a set of design principles for robust and enduring commons. Rose (1986), on the other hand, argues that for some shared resources, the more they are used, the higher is the benefit to all parties. Commons scholars have criticized that in fact Hardin's examples were about open access arrangements instead of governed commons (Hess and Ostrom 2007). To sum up, this existing body of knowledge focusing on natural resource commons points to and analyses patterns, practices and principles of collective action in relation to shared resources by identifying forms of organizing besides the market or the state.

As the digital imprint on societies spread, interest in understanding what commons means in the contemporary networked society emerged in 1990s. Immaterial commons then became a subject of study that was considered as relevant as the study of traditional natural resource commons (Hess 2008, Frischmann et al. 2014). This second research approach to commons focuses on the study of intangible information and knowledge resources. The renewed interest in commons among scholars and practitioners, according to Hess (2012) emerged due to an increased threat of privatization and commodification of common culture and knowledge resources, as well as due to social dilemmas and conflicts related to online resources and networks (Hess 2012). Furthermore commons-based frameworks for collective action are becoming increasingly more visible in our digitally networked society. People who operate in these frameworks develop new forms of participation, governance and modes of production that rely on social networks, technology platforms and shared resources on the Internet. Through these digital tools and systems, the governance and management of especially digital common-pool resources have become easier. To conceptualize this emerging type of immaterial and intangible shared and commons-based resources forming on the Internet, scholars have proposed concepts such as 'information commons' and 'knowledge commons'. New commons are mostly intangible and cumulative resources, such as knowledge or information (hence the name) and other digital resources, which are not depleted by rivalry or overconsumption. It is often argued that these types of new commons follow a logic of abundance and non-rivalry, rather than scarcity, but that they are nonetheless susceptible to novel forms of enclosure and commodification (Ostrom and Hess 2007, Boyle 2008). These new types of enclosure and restrictions include for example digital rights management (DRM), restrictions based on geographical location (geo-blocking), and paywalls. In the context of new commons especially legal scholars discuss the forms of commons goods and whether they are inherently of a public and/or open nature. Some scholars argue that all should have equal rights and symmetrical terms to make use of the resources and participate in the management of commons (Lessig 2002, 2004, Boyle 2006, Benkler 2006, Benkler 2013). Boyle argues that in relation to new commons, the problems do not lie in rivalry over commons, but in other collective-action dilemmas such as the lack of incentives and motivation to create common resources to begin with (Boyle 2008). Here, most of the empirical examples are of open and/or collective action initiatives such as open source projects (e.g. Linux)

and commons-based peer productions (e.g. Wikipedia) that rely on and produce digital resources that are shared online and available for everyone to use. This body of knowledge provides insights into the role of a variety of infrastructures in the digital networked society that by design can enclose or open access to enjoy and (re)produce these commons.

The third strand of research on commons relevant to my research is the approach that considers commons not as shared resources but rather as a relational quality that depends on actions and decisions taken by a group of people (Helfrich and Bollier 2012, Bollier 2014). An important focus of this strand is to identify alternative means for the provisioning and governance of commons. Here, commons is considered as complementary to or as a replacement of the division between the market and the state. The rise of this movement is also seen as a reaction against the growing privatization and commodification of public/common goods (Hess 2008). These scholarly contributions focus on the ongoing process rather than the outcome (how to create commons, how to sustain and govern them, etc.). Commons activists are not only advocating for access to shared resources; they are also interested in developing partnerships and 'educating' people to be part of these processes (see e.g. Pór 2012). Important insights from practitioners' accounts are connected to the ways in which the principles, patterns and practices within commons can be made visible and accessible for others. In addition, activist thinking provides reflections on the roles of the participants – both professional designers and other stakeholders – in commons-like frameworks that operate in an iterative and open-ended process rather than in a specific project.

2.3.2 Cultural and creative commons

The origin of the discussion about cultural commons in the digital and networked era can be traced back to two ideas about particular freedoms and rights related to culture, and specifically to cultural appropriation.

The first argument is built around the right to access and appropriate knowledge and culture that are, or should be, common to all. Lessig's (2002, 2004) writings on free culture emphasize that people should have the right and the tools to create and build upon the digital culture, including on the Internet, and that people should be able to share their new derivative and creative works. This argument became one of the foundations for initiatives such as Creative Commons (CC)

(where Lessig has been a founder) that offer a partial design solution in the form of a licensing framework and digital tools that enable people to share and create new cultural production on more flexible terms than the existing intellectual-property regimes (IPR) allow. Frameworks like CC can potentially support people in pooling creative digital resources to achieve common benefits, and eventually create digital commons. Benkler has summarized this argument as follows: "If we are to make this culture our own, render it legible, and make it into a new platform for our needs and conversations today, we must find a way to cut, paste, and remix present culture" (Benkler 2006). Lessig's thinking, and the free culture movement, borrows and builds upon the F/LOSS (free/libre open source software) movement and its manifesto of *freedoms* to software development, as argued by Richard Stallman (Stallman 1984). The economic success of free/open source software projects also laid the foundation for emergence of similar framings in the commercial sector such as 'open innovation' (cf. Chesbrough 2003) and 'open data' as the new oil for digital businesses[12] that aim to transform open modes of production and creativity, and collaboratively pooled open resources, to commodities.[13]

The second argument is built around the need to safeguard common resources from enclosure, commodification and purely commercial interests. For example, Boyle (2003) propounds a narrative of enclosure, and discusses the multiple threats of privatization and commodification that are confronting many common digital goods and resources today. According to Boyle this "second enclosure movement", e.g. the withdrawal or fencing off of information and digital cultural artefacts, is made possible by new technologies and mechanisms available online. Along the

12 The origin of the analogy is uncertain, however often the credit is given to Clive Humby (2006) who said "Data is the new oil. It's valuable, but if unrefined it cannot really be used." Ever since used widely by corporates and media.

13 The distinction between free and open in relation to shared resources has been considered important especially in context of software development (see e.g. Weber 2004, Stallman 2002). The notion of free is attached to common and peer activities that to a great extend happen outside of capitalism/private ownership. The often used phrase, initiated by Stallman, aiming to clarify the notion of free is "free as in free speech, not free beer"(see the free software definition on https://www.gnu.org/, and Stallman 2002). The notion of open, instead of free, was promoted by Eric Raymond because he found the word 'free' confusing, and (see the original call *Goodbye, "free software"; hello, "open source"* for the community http://www.catb.org/esr/open-source.html). For example Hakken et al. (2016) offers a nuanced treatment of the underpinnings of *free* versus *open* in context of software, and how the social characteristics and practices differ in each.

same lines as Boyle, but with a different vocabulary, Hyde (2010) defends cultural commons by developing an argument and a plea for our common culture, emphasizing how knowledge is common to all and should be safeguarded from purely commercial interests. In this viewpoint, the enclosure of digital cultural heritage can be seen as a capitalist attempt to harvest digital assets for corporate commercial interests. And, consequently, a push toward openness and universal access to digital cultural resources can also be motivated by a capitalist profit-making agenda, and not (necessarily only) by the democratic and participatory agenda that I endorse and stand for in my doctoral dissertation (see Chapter 3 for more elaborative account on author's motivations and position to open in the field of digital cultural heritage). In the Articles 3, 5 and 6 I elaborate some of the challenges commercial interests of open digital cultural heritage might bring to cultural and heritage institutions and practitioners.

It is important to keep in mind that the discussions about cultural commons that are tangible (e.g. physical collections of museums, world heritage sites) and those that are intangible or digital (e.g. digitized cultural heritage records, or born-digital heritage) have very different concerns. With tangible cultural commons, prone to rivalries, the discussion has mostly revolved around the moral and legal ownership of cultural heritage artefacts, focusing on the appropriation and enclosure of cultural sites (Bruncevic 2014, Bertacchini et al. 2012). In relation to digital, intangible and/or inexhaustible cultural commons, the threat of enclosure arises not from the overconsumption and depletion of tangible cultural heritage artefacts, but rather from debates over who has the moral and legal right to access and use these common resources (cf. Lessig 2004, Boyle 2006, 2009, Hyde 2010, Benkler 2013). The questions of "ownership" (or rights to use) in connection to digital cultural commons have spawned debates on two fronts: (a) What should be preserved in digital form, and (b) who can access and use it, and under which terms. Both questions are important to my design research cases.

The use and development of the concept of 'cultural commons' in scholarly literature is recent. In addition to the more conceptual perspectives put forward by Lessig (2004), Boyle (2003, 2008) and Hyde (2010) and discussed above, there are also some more empirically grounded studies on cultural commons that have focused on the institutional arrangements surrounding them, and have investigated these as arenas of collective action (Bertacchini 2012, Madison et al. 2010). In the second case, the concept of cultural commons has been defined broadly as "cul-

tures expressed and shared by a community", and as evolutions of cultures, and their traditions, rituals, symbols, practices, as a form of shared resources (Bertacchini et al. 2012, p. 3). The challenge to conceptualize cultural commons derives from the very understanding and definition of the term culture. In my research I build upon the broad conceptualization put forth by Williams (1976) who considers culture both as practiced and embedded in everyday, a process of creating cultural artefacts or outcomes of the process.[14] Hess (2014) points out that from an institutional perspective, *all* commons are somewhat cultural commons, as "commons concern the relationship between people and resources, either natural or human made" (p. 25). The term 'cultural commons' has also been used to describe a particular way of arranging common digital cultural heritage – similar to the concept of "memory institution" – and has been used as a political vehicle or strategic tool for pursuing change in the cultural sector (for examples see e.g. Edson 2015, Edwards and Escande 2015). In addition, cultural commons has become a favored concept and shorthand for discussing how ordinary people can take part in the creation, production and enrichment of digital cultural artefacts, and take part in the official processes and practices of cultural institutions – such as cataloging, annotating and curating. Hence, cultural and heritage institutions are increasingly exploring ways of creating new partnerships with their publics and of opening up the possibilities for people to curate, collect, contextualize and create cultural works from their digital collections (see e.g. Adair et al. 2011, Ridge 2014, Oomen and Aroyo 2011, Stuedahl et al. 2016, Ciolfi et al. 2017 for examples in the cultural heritage sector).

While cultural commons can be understood in broad terms, in this thesis I focus on three core elements:

(1) Digital cultural heritage resources that cultural and memory institutions are responsible for preserving and creating access to, and the principles and practices related to them.

14 Taming a concept of culture is a quest that many scholars have taken in the social and cultural theory and media studies (see e.g. Hall 1980 for debates in cultural studies, and a literature review of using the concept of culture in media studies in Sommier 2014). This is not my venture in this dissertation, therefore I am making use of a broad understanding of culture by Raymond Williams (1977). In his attempt to create "a vocabulary of culture and society" he reviewed and discussed various understanding from different disciplines.

(2) Digital cultural resources created by individuals or as a community effort and pooled together as common-pool resources and/or commons.
(3) The presence of commoners – people doing the commoning – and the processes in which they provision, govern, sustain, build upon and create new cultural production based on shared digital resources.

In this thesis, I thus understand cultural commons to be evolving commons, cumulative in nature, where various socially situated groups and individuals negotiate the value, creation, use and governance of diverse cultural resources through various commoning activities. These commoners not only shape our common cultural heritage and memory, but also create common-pool resources of knowledge and governance (e.g. principles, guidelines).

2.3.3 Commoning

In an attempt to portray the active nature of commons and commoners that are taking part in creating and maintaining commons the term "commoning" was coined. The use of commoning is an attempt to shed light on the activities of people connected to commons, and the verb form is intended to rather highlight this agency and point away from the more widespread understanding of commons as resources and a resource management system (Linebaugh 2009). Scholars and activists operating in different commons-like frameworks have developed this concept as a way of providing new and needed vocabulary, and to shed light on ongoing collective action in relation to resources in which people have a shared interest. On the other hand, commoning has also been explained as creating and sustaining a commons culture in partnerships between actors (Pór 2012). Hence, the concept of commoning highlights the idea that commons can only be governed and managed through active social relationships, and it points to how social practices, rituals and traditions are rooted in and important to commons (Bollier 2014, Bollier and Helfrich 2012). Bollier and Helfrich (2015) even stipulate that in order to understand or build any theoretical frameworks about commons, one has to "enter into a deep and ongoing engagement with the everyday practices and experiences of commoning" (p. 20). I aim to follow their invitation and approach especially in my third design case in this doctoral dissertation, AvoinGLAM.

In contemporary design research in the field of Participatory Design, commoning has been used as an invitation to rethink the roles of actors in commons-like frameworks (Marttila et al. 2014); as a frame to discuss intertwined practices involving people and cultural resources (Marttila 2016); and as a tool for strategizing and locating socio-material practices as a part of city-making and contributing to urban commons (Marttila and Botero 2016, Seravalli 2014, Seravalli et al. 2015, Parker and Schmidt 2017) and to strengthen local democracy (Hillgren et al. 2016). Teli (2014, 2015a) and collaborators (Teli et al. 2016, Teli et al. 2017, Hakken et al. 2016) have explored the notion of commons, and related social relations and activities (however not necessarily applying the term of commoning). These scholars have probed the potential of commons as a vehicle "to support the construction of distributed social wealth" and to develop a research agenda for "designing for commons" and moving towards "common-oriented PD" (Teli 2015). Regardless of the recent efforts towards combining design, especially in PD, with a multifaceted commons perspective (see Chapter 2), Teli (2015) argues that a political commitment to commons is still lacking in the current discourse and that the understanding/treatment of contemporary capitalism is insufficient. To overcome this deficiency, he proposes that PD scholars "locate the specific commons in the wider perspective of Hardt and Negri's accent on the common, as the ensemble of the material and symbolic elements that tie together human beings" (Teli 2015, p. 18). Drawing from Hess and Ostrom (2007) and Hardt and Negri (2011) Teli and his collaborators (Hakken et al. 2016) differentiates between a plural form of *commons* and a singular form of *common*. Hardt and Negri (2011) view common as "the ensemble of the material and symbolic resources shared among humankind, including natural resources and digital wealth" (according to Teli et al. 2015, p. 19). Furthermore Teli and colleagues argue that "if the commons is the articulation of particular (and fruitful) institutional arrangements, the common is a political perspective of societal transformation (that can leverage the institutional gains and peculiarities of the commons)." Teli urges that PD designers operating in commons-based frames – enabling and enhancing existing commons, or aiming to design new commons arrangements – should take a stance in relation to common. He suggests three dimensions to be considered, especially in relation to contemporary capitalism, to paraphrase: what is the project's connection to a broader socio-historical context, and how does it structure commons and their social relations against this backdrop, and,

finally, how does the designer envision the unfolding of "the ongoing relationship between the commons at stake and the common" (Teli 2015, Teli et al. 2015). Parker and Schmidt (2017) put forward a similar call for PD designers, that they should "be upfront about ambitions and loyalties when expanding from a role of facilitation to one that includes decision-making requiring political responsibility" and to acknowledge "exclusionary aspects" of commons arrangements (Parker and Schmidt 2017, p. 203—204).

In addition to the perspectives of Teli and collaborators, outlined above, the political dimensions of working with commons have been addressed for example in the session 'The Politics of Commoning and Designing' at the Design Research Society conference 2016 (Trogal et al. 2016), which aimed to explore the tensions and potentialities around commoning in design. The research papers of the session employed the commoning concept to discuss e.g. how design can aid in creation of spaces that facilitate commoning processes (Barbosa et al. 2016), or how commoning can help with articulating and acknowledging differences and diversities when designing (Karlssona and Redström 2016). In my research paper for the session, I discussed the commoning practices in a value-driven cultural movement that has a shared interest in opening our common culture and history for a wider public to access and influence, and in safeguarding against enclosure and commodification of cultural commons (Article 5: Marttila 2016). The applicability of the commoning concept within design research is also demonstrated in recent workshops held in design conferences, e.g. 'Designing Commons—Commons for Design: Workshop at DRS 2014' (Marttila et al. 2014), Co-designing and commoning at Nordes 2015 (Botero et al. 2015), and 'Collaboratively articulating "urban" participatory design?!' at PDC 2016 (Eriksen et al. 2016).

These current discussions on commons and commoning resonate well with expanded notions of design (e.g. Binder et al. 2011, Manzini 2012, 2015) and of user participation and 'cultures of participation' (e.g. meta-design, see Fischer and Ostwald 2002). Commons and their related arrangements – and in particular the idea of commoning – speak to forms of collective action that rely on interesting motivation mechanisms for driving contributions, including voluntary work, new forms of membership and collective ideas of ownership, all of which potentially reframe what counts as participation and who should participate (Article 2: Marttila and Botero 2013, see also Light et al. 2013). In my research, I apply the concept of commoning to rethink the roles of actors in co-design and participatory design en-

deavors connected to commons-like frameworks, and use this re-thinking to envision a direction for 'commons design'. The contributions will be elaborated further in the forthcoming chapters.

2.4 Politics, publics and infrastructuring for cultural commons

My personal exploration of the notion of commons began through my practical work in Creative Commons Finland in the mid-2000s. Even if I was familiar with the theory and philosophical discussion on commons, I only articulated and connected the concept to design research and participatory design later (Article 2: Marttila and Botero 2013, Article 4: Marttila et al. 2014). As part of my doctoral research I – together with my colleagues – initiated a seminar that, to our knowledge, for the first time connected the notions infrastructuring and commons (Marttila et al. 2013, Karasti 2014). This *Infrastructuring the Commons* seminar investigated the relationship of the current discourse on commons, to emerging art, design and planning practices – specifically those practices engaged actively with collaborative digital media. A particular objective was to link recent developments relating to practices of infrastructuring (as discussed in urban informatics, participatory design, interaction design, and e-planning) to the idea of design principles as the foundation of sustainable commons. The centrality of design principles to commons was first described by Ostrom (1999) in her seminal *Governing the Commons* book, and then further developed by her close collaborator Hess (2008, 2012) in relationship to emerging new commons (Marttila, Botero, Saad-Sulonen 2013). This seminar, along with the seminar sub-session on *Cultural Commons* that I co-hosted with Erling Björgvinsson (Marttila and Björgvinsson 2013), laid the foundation for my further exploration of the theme.

Participatory Design (PD) practices share commitments and foundations with the commons literature: for example, they both build upon concern for the capabilities and rights of people to act on, negotiate, and decide about their own futures. Both traditions discuss the potentials and dilemmas of collective action, and in both there is an interest in understanding which types of infrastructures could support collective action (Marttila et al. 2014). Moreover, in line with PD's political commitment, an argument has been made that PD should seek to align its efforts

with and contribute to digital infrastructures and spaces that specifically nurture and sustain commons (Teli 2015, Hakken et al. 2015). From this it follows that political advocacy and policy work should be better integrated in ICT and infrastructure development. Slota and Bowker (2016 p. 546) argue that "[p]olicy, then, is not a distinct or separate feature of an infrastructure. Instead infrastructural work is fundamentally and pervasively political." Similarly, Jackson and colleagues argue that "emergent social computing practices and design often impact and are impacted by structures and processes in the realm of policy, with effects formative for each". (Jackson et al. 2014). Standards, interoperability schemas and protocols for infrastructural development are always the result of policy work, political decisions and political advocacy (Edwards et al. 2013). Policy work is not a separate layer from novel technologies or their design; it is and should be intertwined with technology design and development. I return to this discussion in Chapter 3, when I open up the research design process of the doctoral work, and how knowledge production should be directed to three levels: to academia, to public, and to policy work.

In PD, the notions of infrastucturing and commons have been linked to collaborative and open modes of design and cultural production, and to how infrastructuring in explorative socio-technical environments requires new ways of thinking, designing and commoning (Article 4: Marttila et al. 2014, Björgvinsson 2014, Seravalli 2014, Teli et al. 2015, Hillgren et al. 2016). Similarly, although with a different vocabulary, the direction of PD concerned with communities referred as community Participatory Design, or community-based PD (hereafter community PD), recognizes the importance of novel forms of social relationships and practices of groups of people that move beyond formal institutional contexts, and emphasizes the socio-technical relational approach to technology development (DiSalvo et al. 2012). The community PD framing also connects infrastructuring to PD and builds upon the work of Star and her collaborators (Star and Ruhleder 1994, 1996, Star 1999). For community PD, infrastructuring provides a framework to establish 'a common ground' and include all relevant actors, both professional and non-experts, in relation to ongoing and open-ended design of information technology, without giving privilege to either view (DiSalvo et al. 2012). Especially, infrastructuring can help designers achieve better understanding of how publics are constructed, and how PD could facilitate and support these processes (Ehn 2008, Björgvinsson et al., 2010). This has led to efforts to unite infrastructuring and publics in PD scholarship (Ehn 2008, DiSalvo 2009, Björgvinsson 2010, 2012a). Here, "infrastructuring is a particular mode or

practice of PD that develops and provides socio-material resources and experiences by way of attachments toward the constitution of publics" (Le Dantec and DiSalvo 2013, p. 247). Le Dantec and DiSalvo depict that it is through infrastructuring that common resources are developed. This enables participants "to act in response to the inevitable issues arising from interaction and experience with socio-material things" (Le Dantec and DiSalvo 2013, p. 260).

Recently, various exploration and further developments of applying publics in PD practice have been made: e.g. "publics-in-the-making" suggest that publics are formed in the process of doing things together, in continuous iteration, by its human and non-human participants (Lindstöm and Ståhl 2014). It is argued that infrastructuring and *attachments* can be understood as "the social and material dependencies and commitments of the people involved" and are key to the construction of publics (Le Dantec and DiSalvo 2013, p. 242). In these arguments, publics are seen as co-constituted in an on-going intertwined process "discovering and expressing the attachments" (Le Dantec and DiSalvo 2013), or as 'material entanglements' (Lindström and Ståhl 2014). Both arguments also note that publics could be, and increasingly are, formed around *future* artefacts (cf. Latour 2007). Regardless of these efforts to include and build upon the notion of infrastructuring, and to pay attention to publics forming in intertwined process through materials and making, we still know little about how to infrastructure commons that could form around common-pool resources. Production and creation often rely on common-pool resources that have a potential for becoming or sustaining commons. The formation, management and governance of these resources becomes an integral part of infrastructuring strategies. The discussion on publics and infrastructuring in the context of PD casts light on some facets of the problem. However, the literature on commons, both traditional and information commons, provides additional perspectives on the topic, and furthermore suggests novel PD practices and activities, some of which are explored in this dissertation.

Building upon the theoretical contributions on commons and infrastructure discussed in this chapter, I aim to foreground some of the problematic issues related to the infrastructural work and design for cultural commons, and to articulate these findings to develop design strategies. These strategies for co-designing and construct new infrastructures to carry commons and its related practices are discussed in Chapter 5. Next, in Chapter 3, I will discuss my research trajectory and the methodological considerations of my doctoral research.

Finnish Museum of Photography

3. Constructing the field: Research context, design, methodology and cases

This chapter presents and reflects upon my research context and trajectory, including the research design, methodology, and an introduction to the empirical materials and data obtained from the three design research cases. In the beginning of the chapter I contextualize the doctoral research within the digital convergence of cultural heritage institutions through the lens of European policy development. Given that design is culturally and historically situated, I start by outlining the cultural and institutional (pre)conditions of my study and articulate my position as an activist academic conducting participatory design. This is followed by an account of the design research approach and an elaboration of how I have constructed the empirical field of study, after which I discuss the methodological considerations that guided the research design and introduce the design research cases in parallel with the data obtained through the design research activities. To close the chapter, I reflect on the chosen research strategy.

3.1 Backdrop: Digital convergence of cultural heritage institutions in Europe

> *1. Each culture has a dignity and value which must be respected and preserved. 2. Every people has the right and the duty to develop its culture. 3. In their rich variety and diversity, and in the reciprocal influences they exert on one another, all cultures form part of the common heritage belonging to all mankind.*
> Declaration of Principles of International
> Cultural Co-operation, Article 1. UNESCO (1966)

Libraries, archives and museums preserve and protect cultural heritage and culturally significant materials. They are often considered as guardians of our shared history, culture and memories. Over the centuries institutions have developed their domain specific strategies and traditions to fulfill their public mission, to collect cultural records and care for them, and mediate access to these holdings. The digital convergence of the institutions and the digitalization of parts of their holdings have profoundly transformed, and continues to change, these institutions, their role, professional practices, and the means of framing cultural heritage collections and facilitating access to and participation with them.

Two notable concepts have framed the discourse regarding the digital convergence of collecting and cultural heritage institutions: The first one is the discussion on "digital libraries" as an overarching term to denote digital records that form a database or collection, often deriving from different sources that is not only limited to the context of traditional libraries.[15] The second is the notion of "memory institution" to cover different cultural heritage institutions such as libraries, archives and museums and consider them as collectively caring for culture and history of our times. At the time, in the beginning of 1990s, a new conceptual thinking and vocabulary was needed in the emerging era of 'being digital' (Negroponte 1995), when novel information systems were developed and an abundance of electronic records were created. In the sections to come, I discuss these terms – especially the conception of memory institution – to shed light into the political agenda

15 However, it should be noted that depending of the field of research, the term digital library can be understood differently, e.g. in terms of scale or more conceptually (see e.g. Nürnberg et al. 1995, Bishop et al. 2003).

of the European Union in relation to digital cultural heritage. Tracing the implications of the terms here is relevant, as all of the design research cases of this doctoral dissertation are in different ways part of or responses to that EU policy agenda. My focus here is on the contextualization of the political agenda to digitally converge the European intellectual and cultural records. Therefore, I explore the literature, reports and accounts on policy development, and do not elaborate the notion of 'memory institution', as this has been discussed in a vast body of literature or studies on memory or cultural heritage within the field of humanities (see e.g. Assmann et al. 1995, Assmann 2008, Whelan 2016) and digital humanities (DH) (see Nyhan and Flinn for historical account on implementation of computing to cultural heritage and how DH has formed around it). Merely, my aim is to foreground the processes and discourses that have guided the digitizing efforts of European cultural heritage records, and how they influence the design and development of information systems for digital cultural heritage.

Before unfolding this agenda for digital convergence of cultural heritage institutions in Europe presenting a few definitions on terminology is warranted. Under the umbrella term of 'digital cultural heritage' several forms of digital assets can be accommodated (Cameron and Kenderdine 2007). In this dissertation the notion can refer to two aspects: 1) Non-digital tangible or intangible acquired holdings and assets that are transformed into a digital form (i.e. the original asset – e.g. an object or a sound recording is digitized). These types of projects vary on scale and purpose e.g. from 3D modeling of physical cultural heritage sites, to preservation of parts or entire collections. The digital representations of the original asset often accompany additional related digital information/data that is commonly produced in standardized way by the institutions conducting the digitization. This information often also includes some kind of framing of the assets (e.g. descriptions, contextualization, links to historical records) by cultural heritage professionals. The second type of digital cultural heritage is 2) born-digital heritage, i.e. assets that are originally in a digital format and acquired or archived by the official institutions (e.g. electronic records, digital art works); in addition, an example of born-digital heritage is (meta)data that is attached to the cultural heritage assets.

Furthermore, in this doctoral thesis the phrase digital cultural heritage is reserved for official – and often canonized – institutional practices and processes, whereas 'cultural production' is applied to refer to creative activities of ordinary people, practitioners and professionals carried out in the digital environment. The

notion of 'creative re-use' amplifies appropriation of existing digital cultural works often on the Internet. In some cases the outcomes of these cultural productions of these groups can become digital cultural heritage as they are harvested or acquired by the institutions (e.g. archiving from the web) (see Article 6: Marttila and Botero 2017). Digital convergence of collecting and heritage institutions, on the other hand, points to both convergence of technologies and practices in digital environments (Stuedahl 2007, Given and McTavish 2010). With these definitions in place, I will turn to the contextualization of the cultural heritage policy development in Europe.

Information scientist W. Boyd Rayward is thought to be among the first scholars to advocate for the digital convergence of libraries, archives and museums, and to discuss what 'functional integration' could entail in practice to the institutions and for their professional practices.[16] In the end of 1990s Rayward (1998) asserted that the growing body of information and new forms of information sources "will lead to a redefinition and integration of the different categories of 'information organizations'" (p. 207). At the time, according to Rayward, differences in institutional practices and traditions would not play a significant role in the future when digital information would be in commonly shared formats, and "different types of institutions will eventually make little sense" (Rayward 1998, p. 207, Marty 2010). On the doorsteps of the new millennium, heritage institutions faced increased pressure and demands from many fronts – from academia, politicians and citizens – to digitize their holdings and enable access to a wider public (Marty 2010, Dalbello 2009). Demand for access to archival and cultural heritage collections can be seen, on the one hand, as a movement towards democratization of information and culture in general. On the other hand, it can be viewed as an attempt and a step towards consolidation of public institutional service offerings and delivery models for the private sector and commercial enterprises (e.g. providing application programming interfaces (APIs) for building third-party services and applications).

In Europe, where this doctoral dissertation's design research cases are situated, the discourse related to digital convergence was widely influenced by another information scientist, Lorcan Dempsey (2000), who depicted: "Archives, libraries

16 It has been also suggested that Hjerppe (1994) coined the notion of a "memory institution" as a term to combine different types of culture and art institutions, and cultural heritage sites.

and museums are memory institutions: they organize the European cultural and intellectual record" (p. 1). He used the notion of 'memory' to bridge these different collecting and cultural institution's traditions together, and argued for the importance of pooling together the digital archival and cultural heritage resources of different institutions. Dempsey was contracted by European Commission (EC) and its Information Society Technologies (IST) programme to present a research agenda for cultural heritage sector, which he titled "Scientific, Industrial, and Cultural Heritage: A Shared Approach". In short, the programme's objective was to support preservation of, and access to, digital cultural materials in Europe. Dempsey had a vision for a European wide infrastructure that would not be hindered by institutional or national borders (Dempsey 2000, p. 3). In this agenda Dempsey identifies key design and technological obstacles to be addressed so cultural and heritage institutions could provide access to and use of their digital collections. Similarly to Rayward (1998), Dempsey also envisioned the emergence of a new type of a 'hybrid collection' that differs from the specific traditions, curatorial practices, or institutional missions of individual organizations. The basic idea put forward by both scientists is that diverse collections would be part of new infrastructures that could enhance the co-existence and evolution of technology, service and business contexts (Dempsey 2000).

> "This convergence is driven by the desire to release the value of their [heritage institutions'] collections into this space in ways that support creative use by as many users as possible. They recognise their users' desire to refer to intellectual and cultural materials flexibly and transparently, without concern for institutional or national boundaries" (Dempsey 2000, p. 1).

Dempsey's research agenda has had a long-lasting influence for the landscape of European digital cultural heritage, and it became the bedrock for the research efforts of many EC's funded projects to design and develop technology portals and platforms for digital culture and cultural heritage in Europe. It coincided with a strong political push for pooling European digitized cultural heritage, and integrating and harmonizing varying institutional practices, policies and standards. Allegedly, this push was a reaction and a counter-move to the Google Books Project, which was launched in 2005, and gained footing in Europe. As an attempt to safeguard European cultural heritage from commercial interests and enclosure,

a handful of EU member states suggested and initiated the European digital library project (Purday 2009). Later, this initiative became known as *Europeana*, and the organization was formally founded in 2007. The Europeana portal began to harvest and aggregate data from European digital libraries, museums and archives, thus becoming an access point to collective memory.

The EC continued in the direction suggested by Dempsey, pursuing efforts to combine technology, culture and business domains by building on the concept of 'memory' and 'memory institution'. EC commissioned an expert report "The DigiCULT Study: Technological Landscapes for Tomorrow's Cultural Economy: Unlocking the Value of Cultural Heritage" (2002), which offered EC and its members states recommendations and a roadmap with signposts of future challenges and trends that European cultural heritage institutions would face in the years 2002—2006. The study urged these institutions to form new alliances and partnerships across different sectors and user groups, private and public alike, and to pursue new "economic potential" and "value" of digital cultural heritage materials in the new, networked information society (Mulrenin 2002). This study laid a foundation for the Seventh Framework Programme "DigiCult – Expanding the use of Europe's cultural and scientific resources" (2007—2013), which "represents one of the EC's most sustained investigations of technology and cultural heritage to date…" (Stainforth 2016, p. 327). During this time period, the guiding political principles seem to have remained the same. In 2011, EC published "The New Renaissance" expert report of the 'comité des sages' on bringing Europe's cultural heritage online, continuing along the path paved by Dempsey in 2000:

> "The new information technologies have created unbelievable opportunities to make this common heritage more accessible for all. Culture is following the digital path and "memory institutions" are adapting the way in which they communicate with their public" (Niggemann 2011, p. 4).

The New Renaissance report, though, takes a stronger or at least more explicit stance on how to create access to and enable the use of digital cultural heritage in practice (Niggemann 2011), justifying this goal by an economic logic (Poole 2010). For example, the report states that EC member states should make available their significant cultural heritage holdings under public domain mark through Europeana by 2016. It also states that metadata connected to the digitized artefacts

should be released for free re-use for all stakeholders under no restrictions (e.g. CC zero (0) license). In contrast to the DigiCULT report (Mulrenin 2002), efforts for opening cultural heritage materials and data were not only undertaken for the common good and purposes for knowledge sharing e.g. for research and educational purposes. The 2011 report instead contains a strong push towards entrepreneurship, public-private partnerships, and co-creation of new serviced and innovations. This shift in discourse and politics is significant, and resulted in an extensive drive amongst European cultural and heritage institutions to seek collaboration with the so-called creative industries.

The EC has thus persistently and relatively consistently sought to put the political push to digitising Europe's cultural heritage into practice, and to make culture and knowledge more easily accessible for both the public and private sectors. These efforts continue today. At present, however, only a fragment of European cultural heritage held by cultural and collecting institutions are digitised and made available for open and/or free public use. Europeana continues to act as a nexus for European digital cultural heritage, and aims to develop a community of professionals across different stakeholders. However, severe budget cuts and the EC's requirement that projects move towards independent funding led to the Strategic Plan, which had an emphasis on offering service-based models for institutions and on forming new partnerships between public holdings and entrepreneurs (Stainforth 2016).

In the same time span, NGOs and networks alike (e.g. Open Knowledge's OpenGLAM) have embraced memory as the common denominator, a way to organize or look at collective heritage. In doing so they embrace Rayward's (1998) call for digital convergence of libraries, archives and museums, and Dempsey's (2000) notion of 'memory institution', which was adopted by EC and by many of the projects that were funded through its programmes and funding instruments. As argued by Stainforth (2016) the notion of memory institution generally became a blanket term often used uncritically to describe entities that are connected to digital technologies and media.

In practice, however, these cultural heritage institutions are contested and complex entities, which shape cultural meanings and understandings through various processes of knowledge production through their diverse professional practices. Controversies have arisen both regarding the representation of memory, and in relation to what counts as heritage or as historical records, and what does not (Cam-

eron and Kenderdine 2007). To Robinson (2012), the very overarching umbrella term of memory institution simplifies and generalizes the concept of memory and "marginalises domain-specific approaches to the cataloguing, description, interpretation and deployment of collections that lead museums, libraries and archives to engage with history, meaning and memory in significantly different ways" (Robinson, 2012 p. 414).

I share this critique, and in retrospect I find – as I will discuss later in this dissertation – that the framing of memory institutions can be highly problematic. Pooling together cultural and intellectual records from various sources does not necessarily lead to a rich and balanced collection from our past.

In addition, approaching digital convergence of archives, museums, and libraries only through lenses of institutional and canonized memory overlooks the role of private and community memories in the construction and representations of 'collective memory' (see e.g. Young 2000) or 'public memory' (cf. Casey 2004). This type of infrastructural work, bridging solely institutional practices and collections through the notion of memory institution, was a point of departure for providing access to European digital cultural heritage. Albeit in recent years there have been efforts to invite and include individual citizens and communities of interests or practices to take part in the development and maturing of the Europeana platform (Benardou et al. 2017) and view European digital cultural heritage in more collective terms (Europeana Foundation 2011, Edwards and Escande 2015). In addition, initiatives such as Europeana Labs attempt to bring cultural heritage institutions' own platforms and practices together with community practices and community-created content and software, and develop common-pool resources.[17] Yet, in Europe there still seems to be a lack of a *socio*-technical infrastructural approaches to developing truly common culture and multiple understandings of history and cultural heritage.

17 I have also been taking part in the Europeana Creative project (2013—2015) that aimed to support and stimulate greater re-use of digitized cultural heritage resources. One of the objectives was to set-up and feed to Europeana Labs, and enhance community engagement. However, work realized in this project is not part of my doctoral dissertation.

This glance at the backdrop of digital convergence of European cultural heritage institutions through EC policy perspective is relevant for my doctoral research for three main reasons:

First, two of my doctoral research cases, Fusion and EUscreen, were co-funded through the EC's funding instruments[18], and therefore were inherently framed by the aim to integrate European cultural heritage institutions and pool their collections into one joint online collection through a single access point. The third case, AvoinGLAM, was initiated as an *alternative.* One that would build upon a more collaborative approach to share and negotiate our common digital cultural heritage, and socially manage and care for these resources (cf. Light and Akama (2012).

Second, the EC's official programs favored and foregrounded the perspective of cultural heritage institutions over citizen or community interest when creating reservoirs for cultural and historical content online, and on building information and communication technologies (ICT) to mediate (open) access to them. In the AvoinGLAM case, neither view was prioritized or privileged. My engagement with the technology development for European digital cultural heritage showed that there is a great potential in fostering productive, collaborative relationships between, on the one hand, institutionalized digital cultural heritage preservation initiatives and, on the other hand, citizen and peer-to-peer online media practices and infrastructures. To emphasize, it is this challenge that I engage in the research articles that make up this doctoral thesis. Furthermore, in this introductory chapter to the doctoral dissertation I am suggesting an alternative framing to memory institution to guide how we design and develop infrastructures for common culture and shared cultural heritage, and throughout my work I propose that the notion of cultural commons could provide a more appropriate and fruitful framing.

Third, the EC's political push for openness, and how it was rolled-out, had a major impact and influence for framing of the projects and initiatives. As discussed earlier in this chapter, digitalization has profoundly transformed – and con-

18 The P2P-FUSION project was co-funded through DigiCult under the 5th framework programme, which in short aimed at supporting projects creating access to cultural heritage and preserve cultural heritage assets for future generations. The description of the programme is available at http://cordis.europa.eu/fp5. The EUscreen project was co-funded under the 6th Framework programme, which supported initiatives to develop information systems and technologies to access and use digital cultural heritage collections and sites.

tinues to reshape – collecting and cultural heritage institutions, and institutional and individual professional practices and processes. In the mesh of 'being digital' demands, requirements for 'being open' came in to play.

Next I will return to the notion of access and its various dimensions in order to situate my design research in relation to different political views and agendas found in contemporary design discourse.

3.2 Locating politics of access

Intellectual property (IP) issues and other policy frameworks have a significant role in defining the relationship and level of access citizens can have to digital cultural heritage.

Perhaps the most known part of IP, for the broader public at least, is copyright law[19]. Copyright defines the rights to use and access cultural work. In one sentence, copyrights grant exclusive rights and control to an author or creator of original works and their use, access and distribution. It is good to bear in mind that copyright legislation, as all legal frameworks, is a historical conception and a social agreement that has evolved over time and varies in different legal jurisdictions and is subjected to varying interests in our societies. Copyright is also a lucrative business model for creative and legal industries and a part of the income of many authors. While some media companies and rights holders lobby to extend the duration of copyright, other critical voices in the debate consider copyright regimes to be serving the free market capitalism system (see e.g. Lobato 2008, Söderberg 2002).

According to Brucevic (2014) discourse on access to arts and culture from a legal viewpoint has revolved around two standpoints: "e.g. discussing return, restitu-

19 As my doctoral research is conducted within the European Union, I mainly refer to the European copyright legislation and policies, and especially in the context of AvoinGLAM I refer to Finnish copyright law. I do make an exception when I discuss cultural works the copyrights of which are expired, waived, or fall under the declaration of not-known-copyrights (or orphan works), in this context I use the short-hand *public domain* works even if this conception is not employed directly by some of the EU member states. Nevertheless the use of the term public domain is widely in use in Europe (e.g. by Europeana and OpenGLAM).

tion or repatriation of artworks that have been stolen, looted or otherwise acquired where, culture functions as an identity or an ideology" or "a new media, internet, information and knowledge society perspective" (Brucevic 2014, p. 24). Looking at this division in discourse, my research stems more from the latter perspective. The fundamental aim of my design research, opening wider access to institutional digital cultural heritage holdings and official practices, is built upon representing and giving priority to the interest of the citizen and the public over private corporate interests. This said, I have to stress that I do consider discourse on e.g. cultural appropriation and moral or legal "ownership" of cultural artefacts and historical objects highly important, although these issues have not been the focus of my investigation in my doctoral work. Nevertheless, over the course of the work I encountered many interesting participant accounts on ownership and use-rights by cultural practitioners and representatives of institutions alike that ended up influencing the participatory design activities conducted within this doctoral work (e.g. a perception that a collection 'belongs' to its curator, when from a citizen's perspective the right to access and use is granted if collection is acquired and maintained through public funds). These issues are worthy of future research.

Before turning to the methodological choices and describing the design research cases of my doctoral work, it is important to further articulate my personal perspectives on the politics of access in relation to discourses found from the field. An explicitly articulated perspective is warranted as my action in the design research projects is filtered and framed through it. In here I am following Lucy Suchman's (2000, 2002) call for "located accountabilities" in technology design and development. Tracing, identifying and acknowledging the designer's participation and position can enhance the responsibility of technology development and use. For Suchman "design from nowhere" or the ignorance of the designer's own position can cloud technology design and use, and its incorporated social relationships. Although knowing one's perspective is always limited and imperfect, "[t]he only possible route to objectivity … is through collective knowledge of the specific locations of our respective visions" (Suchman 2002, p. 96).[20]

In an attempt to locate my perspectives and positions in the field of my study, I make use of selected literature by contemporary scholars as vehicles to lay out

20 Here Suchman builds her argument upon Donna Haraway's notion of situated knowledges (1991).

some of the varying perspectives that exist and clarify my particular stance for the reader. First, I turn to the open access movement to unfold the perspectives on the notion of open access. To complement this conceptualization, I return to the work of media theorist Ramon Lobato (2008) who approaches issues relevant to the debate revolving around openness and access, through a discussion on copyrights and intellectual Property (IP) and through critical treatment of various dimensions of the term "piracy".

Open Access (OA) can be seen as an alternative to approaches that restrict or control access. It denotes free/open online availability of digital resources with a consent from an author. The OA movement advocates free access to educational resources, research outputs, scholarly papers and articles. In addition, similarly to F/LOSS and Creative Commons (CC), OA also formulates different levels of and conditions for access[21]. There are different motivations to publish scholarly work as OA that serves here as a backdrop to understand different arguments for open access in general. Hall (2009) identifies for example: 1) "the economic argument", asserting that publicly funded research should be accessible for citizens, 2) "the moral argument"; which insists that research should be publicly available, especially for those inhabiting less wealthy countries; 3) "the healthy democratic public sphere argument"; which considers that in part, the academic community could contribute to the public good and wealthy for all; and 4)"the gift economy argument"; that suggest that OA works could in part advance a gift economy model rather than a monetary economy model. Here OA outputs are considered as gifts that are means of exchange, and not money.[22]

When I situate my personal argument for working towards opening access to public digital heritage against these four motivations, I assert that my argument is aligned with the democratic interest. My motivation lies in contributing to a more

21 For example in case of publications OA these modes of publishing are commonly known as Green OA and Gold OA. The latter refers to published work on OA journals, and the Green OA indicates publishing or process of self-archiving where authors make their own work available on other digital platforms/repositories. In OA, similarly to F/LOSS, some have made a separation between *gratis* OA and *libre* OA. Libre refers not only to the cost of access, but freedoms to use, share and create derivative works (Hall 2009).

22 The motivations of OS software engineers are also sometimes connected to the gift-culture (see e.g. Zeitlyn 2003).

open and participatory society, in which citizens have more means for taking part in processes currently occupied mostly by professional gatekeepers. If social and commercial innovations emerge though open cultural data and content, I consider them as a by-product, not the main driver for my work. As Nathaniel Tkacz (2012) eloquently summarizes – building upon Karl Popper's (1962) reasoning for open society and knowledge production – "Openness is necessary because nobody can know for certain what the best course for society might be from the outset, and at the same time it is assumed that openness provides the best possible conditions for producing knowledge and, therefore, making better decisions" (Tkacz 2012, p. 389).

While open access refers to granted access to knowledge resources, the term 'piracy' is often – especially in everyday language context – applied to activities granting unauthorized access or use without consent or permission. The term piracy is highly problematic, however here it serves me as shorthand to point to activities that in current legal frameworks are consider illegal. Lobato invites us to consider what piracy could "do for communities across the globe by assessing its social, cultural, and economic effects as well as its moral implications" (Lobato 2008, p. 29). He suggests to rethink the notion of privacy and puts forward six perspectives: 1) The conventional and perhaps most common understanding is "piracy as theft" that encompasses the idea of creativity as a form of ownership and capital that should be safeguarded and protected by legislation. In digital environments these acts could include activities such as illegal file-sharing on digital platforms such as Pirate Bay. Second perspective, 2) "piracy as free enterprise" considers the activity as a "commercial activity catering directly to market needs" (p. 22) where piracy is not a critique of the capitalist system but instead embraces it. Lobato gives contemporary China's modes of mass-production as a prime example of this type of piracy. 3) "Piracy as free speech" spans from a critique on current copyright laws. He situates this discourse to free/open-source software movement, to "techno-libertarianism" and figures such as Lawrence Lessig and movements such as Creative Commons and Electronic Frontier Foundation (EFF). Here the argument for access and appropriation lies in the narrative that current IP regimes hinders creativity and democratic innovation (see Lessig 2001, 2004), or in justifying access and 'civil liberties' in the digital environment against gatekeepers and corporates (e.g. EFF suggests that computer code can be understood as an act of free speech). In Lobato's critical reading the 4) view is "piracy as authorship" where he draws from the critical postmodern thinkers such as Roland Barthes, Michel Foucault, and

Jacques Derrida. These philosophers rejects the notion of traditional authorship and questions the idea of "originality, innovation and expression" in cultural expression and production (p. 26). Lobato argues that IP and copyright favors artefacts and cultural objects produced by Western cultural industry over some other forms of creativity, such as performance arts, and, I would add, intangible cultural heritage. He also reminds us of the shifting boundaries of what constitutes e.g. plagiarism—inspiration, appropriation—theft and reproduction—in relation to original. As a 5) perspective on Lobato offers the notion of "piracy as resistance" where it is an activity performed against capitalist order and class. Lobato builds this argument on work of political economists that consider "the media to be a system of control and exploitation that operates in the service of capitalism" (p. 28). As the final and 6) perspective Lobato encourages us to consider "piracy as access" that highlights its "transformative aspects" and potential rather than issues revolving around property and ownership. Lobato invites us to consider piracy in so called economically under-resourced nations, where the act of piracy is not often a moral choice or a mode of everyday resistance, but could be a question of economic survival that builds upon new modes of production and upon the productivity of piracy. Through this perspective, the turf battles in Western countries over rights over commercial gains and freedoms seem irrelevant, replaced by the acknowledgement that piracy can transform peoples' futures. Lobato concludes that we should consider that "piracy is a distributive technology—it enables ideas, knowledge, and cultural production to circulate in and through society—and should be recognized as such" (Lobato 2008, p. 29, 31). Lobato's treatment of piracy provides new windows for openness, and makes the notion thicker.

As reviewed above, open access is not a straightforward matter. In my doctoral research and my media and participatory design practice I have endeavored to facilitate open access to digital cultural heritage resources understood as an opportunity to engage with the assets freely (without cost), and if the permissions have allowed, I have supported the use and creative re-use of digital cultural heritage collections. My motivation for advocating open access in my design research activities derives from, and builds upon, the perspective of Participatory Design (PD) and its political aims to democratize technology design—open it to citizens. I also draw from the non-governmental organizations (NGOs) and movements

Creative Commons (CC) and Open Knowledge (OK)[23] and their pursuit of offering alternatives to the contemporary copyright regime in the digital environment and enabling a more open society in practice. People operating in these frames have different political views, and can have very diverse, sometimes contradicting, agendas. To give a simple example, some groups aim to develop new business models for using open data, while others direct their efforts to produce common free learning resources.

To summarize, my argument towards open access and openness in the digital cultural heritage domain builds upon the free speech ideal and democratic participation in our common history and culture. I believe, applying the vocabulary presented by Lobato (2008), that creatively using digital cultural heritage materials has transformative potential that should be cultivated and cared for. My argument for open access is a moral argument, not an economic one. Even if I advocate the free availability of digital cultural heritage resources for citizens, my grounds for pushing for openness stem from an ethical standing. This worldview is in this thesis expressed as being an 'academic activist'. This notion is borrowed from Pecorelli (2015) and complemented with the "hacktivism" design research approach and "an engaged activist designer" put forward by von Busch (2008, 2014) that brings the collective action and decentralization of power to play. Activist academics aim to "challenge an unfair economic, social and political order" as well as challenge us academics ourselves (Pecorelli 2015, p. 147). Similarly, hacktivism (hacking and activism) "deals with public issues and social 'troubles' in participatory ways in order to change unjust social conditioning". It aims to develop "abilities" to participate with systems and infrastructures embedded in our societies (von Busch 2014, p. 227, see also Bookchin et al. 2013). Building and supporting capabilities and abilities through theory and critical making are in the heart of doing the work of the academic activist.

In the following sections I situate this articulated research perspective in the field study, and describe why and how I have decided on the cases of this doctoral dissertation.

23 The two social movements Creative Commons and Open Knowledge are closely linked to all of the three design research cases. Throughout the doctoral research I have been connected to the Finnish chapter of CC and advocated and advised the use of the CC licenses, both for institutions and individuals. I was also one of the founding members of OK Finland.

3.3 Design methodology: constructing designerly enquiry

Designing can be understood as a transformative process that creates change, and at the same time as a cognitive process that seeks to understand the context of change (Jones 1984). Herbert Simon sees design as an activity that belongs to everyone, and a designer as one "[…] who devises courses of action aimed at changing existing situations into preferred ones". In this sense designers devise preferred situations based on their understanding of existing ones (Simon 1969, p. 129). How designers obtain understanding of the situation to be transformed was at the center of Donald Schön's work on the *reflective practitioner.* Schön illustrated multiple ways in which the understanding of the situation affects the designer's transformative intention and how, in turn, working on these possible transformations also affects the designer's understanding of the situation (Schön 1983).

Design is often considered as a way to address a very specific and framed problem, and offering a particular design solution to it (Nelson and Stolterman 2002). On the other hand sometimes issues are difficult or impossible to solve due to the changing conditions or conflicting requirements that often are interconnected, which can mean that an attempt to address one facet of a problem may reveal or create new challenges. Such ill-structured problems are termed *wicked problems* by Rittel and Webber (1973) in the context of social planning. They defined this notion through a set of characteristics that foreground the wickedness of the problem such as "there is no definitive formulation", the solutions are not "true-or-false, but better or worse" and these solutions are difficult to evaluate. In addition the very definition and scoping of a wicked problem can be carried out in various ways: "The choice of explanation determines the nature of the problem's resolution" (Rittel and Webber 1973, p. 142). According to Buchanan (1992), within design research the problem can be considered wicked when design situations are complex or problems are systemic, issues and information are perplexing, and when there are many stakeholders with contradicting interests and values. In my doctoral work I have identified and approached my design research problem as being wicked due its qualities of being a complex socio-technical systemic infrastructural challenge in which there are many stakeholders with contradicting agendas.

These types of tangled and wicked design situations have been investigated by both Simon (1969) and Schön (1983), to whom I referred in the beginning of this section, the latter suggesting that designers reflect on their professional design praxis in order to approach the 'messiness' of the given design situation. Simon (1969), in turn, suggests taming the messiness through creating a design space where rational problem solving can be achieved (Robertson and Simonsen 2012 p. 122). These approaches in design research literature and practice has been considered as opposites (Huppatz 2015), although, for example, Nelson and Stolterman consider design as a tradition encompassing "integration of *thought* and *action* through design" and abandon the traditional separation of crafts and science (Nelson and Stolterman 2002 p. 11). My own stance on framing design in this doctoral dissertation, and the foundation to which I establish my study and research area, leans on Nelson and Stolterman's (2002) call to combine thought and action to tackle ill-defined, messy and interdependent design situations in participatory processes through reflective designerly ways of inquiry and knowledge production (cf. Schön 1983, Cross 1995, 2001, 2009). My work aims to follow "[…] a systematic enquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value and meaning in man-made things and systems" (Archer 1981, p. 30).

Traditionally the purpose of developing a research design is to ensure that a researcher will obtain data from the field that enables her to address the research problem in an as efficient and adequate manner as possible. When approaching a wicked problem, perhaps a more responsive and participatory approach is in place. In my research design, I seek to tackle the wickedness of creating wider public access to and use of digital cultural heritage in various domains in our society. This has meant that I have revised both the field of research and research problem during the course of the cases, and after each design research case. In the beginning of the journey I did not have a single strictly defined research *problem* in mind, no definite theoretical or practical puzzle set from the beginning for which I aimed to collect evidence as effectively and logically as possible. Instead, framing the research inquiry as driven by an aim – bridging institutional cultural heritage systems and practices with the practices of everyday digital culture – the problem and questions are treated as a process of reflection and reformulating (cf. Agee 2014), akin to the reflective design approach as explained by Schön (1983). This iterative approach has been guided by an articulated research interest and motivation that

has been unfolding and developing over time through interactions and design experiments that I encountered or that I actively constructed in the cultural heritage field. Thus, even though the research questions have been revisited and redefined after each case together with the research participants, my overarching design objective and quest of my doctoral work has remained constant: to employ design and design research to enable wider and open access to the everyday digital culture and public cultural heritage, and to support and stimulate legal creative re-use and appropriation of these materials.

In understanding the interplay between design work and research, and the process of obtaining empirical data, I have found useful the notion of *constructing the field* that is present in contemporary ethnographical design research (Blomberg and Karasti 2013). In these discussions, the field does not simply await to be discovered by a researcher, it is rather a result of her active engagement and her journey[24], which is influenced by series of choices she makes along the way, and by her motivations and interests. This construction of the field involves various interrelated activities, materials, people, relationships and experiences that are shaped by the opportunities and resources accessible at the time to the researcher. These opportunities, both personal and professional, are filtered through the research interests and motivations of the researcher, and a number of such approaches have shown their usefulness in design research (Amit 2000, Blomberg and Karasti 2013, Karasti and Blomberg 2017).[25] Karasti and Blomberg (2017) summarize: "[in] studies of infrastructuring, i.e. ongoing and continual processes of creating and enacting information infrastructures, researchers are engaged in constructing myriad of choices they make about what aspect of the complex and extended phenomenon deserve their focus" (p. 2).

24 In ethnographic research a journey is referred to regularly as a metaphor that depicts the passages of a researcher on the field(s) conducting fieldwork to explain something new from the field.

25 In context of design research Torres compares the notion of "field", as used traditionally in social sciences, to a Research through Design project in which "cognitive and transformative goals …[are] integrated into the very processes" (Torres 2010, p. 1). In addition, the field is constructed by interconnecting many processes together in research that could be called "design praxiology - study of the practices and process of design" (Cross 1999, p. 6).

In traditional ethnography, a researcher accesses the field through long-term engagement, and through everyday encounters and nurtured relationships produced on the site aimed to understand the social phenomena and construct ethnographic accounts (Spradley 1980, Wolcott 1999). In current ethnographic practice, fieldwork does not necessarily mean traveling to, or staying physically in one place or field. Studies engaging with wicked problems and complex social phenomena cannot focus on only a single field site but require multi-site ethnography (Marcus 2007). In practice, multi-site ethnography often entails a selection of sites from a large collection of potential sites, and its essence is to "follow people, connections, associations, and relationships across spaces" (Falzon 2009, p. 1). The way I engage multiple sites is inspired by Beaulieu's (2010) concept of co-presence, instead of co-location or multiple sites, as a point of departure for ethnographical fieldwork and knowledge production. The strategy of co-presence discards the traditional requirement of a researcher being physically present in multiple sites in the field.

Karasti and Blomberg advocate that there is a need to move towards multi-sited and "temporally and spatially extended" ethnographies of complex phenomena such as information infrastructures (Blomberg and Karasti 2013, 2017 see also Karasti et al. 2010, Karasti 2014). According to Karasti (2014) this kind of "empirically based, reflexive take on bounding the information infrastructure and infrastructuring has been lacking to a large extent in the PD field" (p. 148). My doctoral research aims to partially answer Karasti's call to study infrastructuring through empirical reflection.

These perspectives on *constructing the field* and *being in the field* and the ways of conducting fieldwork in multiple sites at the same time resonates well with my design research aim. The ethnographic research literature, therefore, has been helpful for me to engage with different aspects of and differently sited and situated actors in the digital cultural heritage field in an open and flexible manner, and connect the distinct findings from my cases by situating the cases in this field. I return to these notions in Section 3.6 of this chapter when I am reflecting on the chosen research approach and strategy.

Connecting and configuring various sites of digital cultural heritage during fieldwork is one way in which I have constructed the field of study for this doctoral research, and at the same time, it has defined the design space and design experiments within the cases. My interaction with the field began through the

Fusion case (Case 1), followed by EUscreen (Case 2) and AvoinGLAM (Case 3). I will introduce these cases and selected co-design activities from them later in this chapter. Each of the cases have been multi-sited and contained engagements with various human and non-human actors, which has produced a rich set of data.

In the cases, I have applied direct (e.g. interviews, questionnaires) and indirect (e.g. participatory observation, analyzing re-use outcomes) tools and techniques for investigation and obtaining the empirical materials. Furthermore, co-design, co-creation and other participatory events and experiments are at the core of the fieldwork. In this sense it is not ethnographic fieldwork, which seeks to observe without disturbing unduly – even if I am aware that non-disturbance is impossible (Haraway 1991) – but design fieldwork, which actively alters and experiments with the field. Participatory and co-design methods and approaches have in this way changed standard fieldwork methods and ways of accessing and being on the sites. These methods, research methodology and approach are discussed in more detail in the following sections. However, before that, some limitations of the study should be mentioned; geographically the research is Eurocentric, as all of the cases and co-design experiments are conducted in European countries with European cultural heritage, and informed by debates and priorities among EU countries. My two first cases derive from projects co-funded by the EC, and were planned to meet the objectives of the work program and policy of building 'a memory institution' (see Chapter 2). The third case contrasts the two first by being a cultural movement rather than a technology experiment, and by setting its own agenda. However, I have selected to analyze and address participatory design activities within a movement that itself was part of the outcome of my research and my construction of the field – most AvoinGLAM activities have been carried out within the frame of projects funded as part of my research, albeit also influenced by the interests of external funders. By highlighting he way in which research priorities and agendas have been part of constructing the field in this manner across all three cases, I hope to enhance the validity and comparability of my design research activities and findings.

3.4 Participatory research methodology

This doctoral research has been conducted by following a participatory research methodology. What makes participatory research different from more conventional or classical research processes is the distribution and alignment of power. In participatory design research, the aim is that all participants involved bring their experiences and perspectives to the design process and knowledge production as co-designers and co-researchers and take part of the design-making processes. At least this is the ideal. Participatory research orientation requires setting up a "democratic social and political context" and a constant consideration of who participates and who is included/excluded (Bergold and Thomas 2012).

The methodology applied in this thesis is a combination of Participatory Design, Action research and Research through Design (also called Constructive Design Research). The latter methodological choice follows the suggestions by Frayling (1993) and Acher (1995) to consider creative processes that are applied and accounted for as a research method for knowledge production through "designerly ways of knowing" (cf. Cross 2001). The difficulty to communicate and convey the validity and rigorousness of knowledge production in design research projects and experiments has been acknowledged by Brandt and Binder (2007), who suggest the interplay of the notions "program, experiments and questions … as a methodological grounding of design research driven designerly experiments". The research *question* guides the research inquiry, and the *program* frames and contextualizes the design experiments. Furthermore, the experiments are ways to investigate the program, and consequently they may change the research question. In turn, the program is vital for mediating between the research question and design experiments (Brandt and Binder 2007, p. 5). Redström and Binder (2006) discuss programs in design research as clearly expressed articulations that provides a frame for conducting design experiments. A program functions as an interim 'knowledge regime', and while the design research and experiments evolve, also knowledge production unfolds (p. 4). To illustrate, in my design research *a program* is my articulated academic activist position and my quest for openness, and through design experiments I reflect this program in dialogue with the participants and stakeholders. Against the background of the theoretical framework, experiments are linked, in the action research process, to the wider socio-technical phenomenon of surrounding digital cultural heritage.

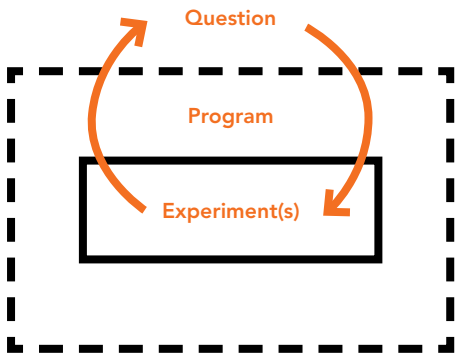


Figure 1. An illustration of the dynamics of research question, program and design experiments. Original illustration by Brandt and Binder (2007).

My participatory research methodology has three pillars. The first one is Participatory Design (PD) and especially the Scandinavian PD tradition, which I have introduced already in Chapter 2. In the beginning, Participatory Design was defined as "a maturing field of research and an evolving practice among design professionals" (Kensing and Blomberg 1998, p. 167), and understood as a "rich and diverse set of perspectives and experiences" (Suchman 1993, p. viii). Later, as PD matured, it was understood both as a research methodology and a knowledge perspective (Spinuzzi 2005), and subsequently grew into a research discipline (Simonsen and Robertson 2012). The PD principles and practices, tools and techniques have been developed nearly 40 years, and the PD toolbox now comprises a rich selection suitable for different participatory and co-design contexts (cf. Schuler and Namioka 1993; Kensing and Blomberg 1998, Simonsen and Robertson 2012). In order to help PD practitioners in the selection among suitable tools and techniques for various participatory design activities, Sanders et al. (2010) have developed a framework and vocabulary for helping PD practitioners in deciding which tools and techniques are appropriate for their research problem. They define and differentiate the PD vocabulary as follows: tools are "the material components that are used in PD activities", techniques are means to describe "how the tools are put into action", "a method is a combination of tools, toolkits, techniques […], whereas "the approach describes the overall mindset with which the research plan is to be conducted". Sanders and co-authors also propose a framework for categorizing

different modes of tools and techniques for participatory design activities, comprised of three facets: "the form, purpose and context" (Sanders et al. 2010, p. 2).

I use PD as a mindset and an approach to how to carry out my design research. In addition, I make use of the tools and techniques developed within the field in all of my cases. I have chosen the specific combination of tools and techniques that aid my participatory design activities and experiments to serve specific purposes in each of the three cases. The empirical material of my dissertation thus mainly comes from a body of participatory design activities and experiments carried out in the cases, and therefore PD methods are central to my thesis. PD tools were used for three key purposes: First, for understanding emerging media and social practices linked to digital culture and digital cultural heritage; Second, to collectively imagine and rehearse desirable futures (e.g. technologies, social arrangements), and, third, to co-design and co-create strategies and solutions. These activities included use of commonly known PD tools and techniques e.g. co-design workshops, scenario work, paper mock-ups and functional prototype building, design-by-doing experiments and other hands-on creative activities. Furthermore, novel approaches, tools and techniques (e.g. an open culture hackathon, a design game) were developed. I combine these methods with those inspired by ethnographic research and its tools, such as first-hand participant observations, semi-structured and open-ended interviews. (The specific activities are discussed in section 3.4 and in Articles 1, 3, 5 and 6. The Tables 4–6 list the used methods, tools and techniques applied in the participatory design activities in the cases).

In Chapter 2 I discussed how the Participatory Design and co-design approaches have moved towards more open-ended practices and away from strictly defined projects and processes. This shift grew out of the understanding that practices and culture are constantly changing, and that this affects how to design and what to design. Similarly, in my effort to establish meaningful relationships in participatory design activities and obtain knowledge about the future design artefact, its contexts and the actors involved; my own PD practice took a turn towards openness and a direction to less rigid and structured forms of collaboration and collective action. In addition to acknowledging the changing design situations and the requirements they were posing, I followed one of the core notions of PD – considering these processes, an on-going "mutual learning between multiple participants in collective 'reflection-in-action'". While Schön's perspective is that of an individual practitioner, in PD the perspective is often communal (Simonsen and Rob-

ertson 2012, referring to Schön 1983). The collective mutual learning (cf. Bødker et al. 2004) was devised to be progressively more open-ended in each of my cases.

For me, in addition to using the approach, practical tools and techniques of PD, a very important quality of this approach is the attention to ethics and politics embedded in the design practice. This is captured in the concept of "design-by-doing" (Ehn and Kyng 1987, building upon Dewey's learning-by-doing), and the spelled-out objective of changing the socio-political contexts in which new technologies will be situated (Spinuzzi 2005). While Research through Design (the second pillar or my methodology) does not deem participation of prime importance, participation in PD "needs to happen, because those who are to be affected by the changes resulting from implementing information and communications technologies, should, as a basic human right, have the opportunity to influence the design of those technologies and the practices that involve their use" (Robertson and Simonsen 2012, p. 32). PD considers knowledge production process dialogical that is mediated through values, both designers and participants (Frauenberger et al. 2015). This political commitment of PD has been a significant driver for my design research activities.[26]

The second pillar of the research methodology is the Research through Design (RtD) or Constructive Design Research (CDR) approach that deals with the making of design experiments. Here a design activity or process, or design artefact (or all of them) become means to obtain and produce knowledge, similarly to the role it plays in PD. RtD is "an approach to scientific inquiry that takes advantage of the unique insights gained through design practice to provide a better understanding of complex and future-oriented issues in the design field" (Godin and Zahedi 2014, p. 1). The RtD approach was introduced by Christoffer Frayling (1993) as a way to differentiate between different modes of research and knowledge production within arts and design. In his pamphlet, Frayling suggests three modes of knowledge production: "research *into* art and design, research *through* art and design and research *for* art and design". Examples for knowledge production *through* art and design include e.g. development work of technology, communication and contextualization of results of practical action research. Frayling describes RtD as "[t]aking design as a particular way of thinking, and a particular approach

26 The politics of Participatory Design has been also criticized see e.g. Keshavarz and Maze (2015), as well as perspectives of participation see e.g. Cooke and Kothari (2001).

to knowledge, which helps you to understand certain things that are outside design" (Frayling 1993, p. 5).[27]

Constructive Design Research (CDR) is often used as synonym to RtD. Ultimately CDR is about the interplay between design and research, and about the means of producing knowledge in the discipline through research and design things (things here understood as in Ehn 2008). Koskinen et al. defines CDR as "Design research in which construction – be it product, system, space, or media – takes center place and becomes the key means in constructing knowledge." (Koskinen et al. 2011, p. 5)[28] Here, the investigation and knowledge production is conducted through creative design activities and experiments with some shifts in focus, e.g. developing new knowledge about the practice itself or about the outcomes of the practice.

At the core of my research design has been a myriad of design experiments that have taken shape through an articulated design research interest and political aim (or a program if we apply the terminology of Brandt and Binder (2007). Sometimes experiments were also staged and carried out in order to convey an agenda or a direction within the larger project frame, or to obtain knowledge about the phenomena or a specific entity (e.g. video remix practice, licensing processes). Therefore I am building upon the RtD literature to discuss knowledge that emerges from design practice, and artefacts and experiments produced within the

27 Over ten years later, Findeli (2004) re-visited these three modes and re-articulated them, and according to Godin and Zahedi (2014) in their literary review on Findeli "formalized the academic merit of Research through Design approach. During the same time, in the beginning of the millennium, also other scholars began to pay more sustained attention to the RtD approach (see e.g. Buchanan 2001, Cross 2001, Margolin 2002). Building upon Frayling's notion of RtD, Zimmerman et al. (2007) developed a framework of RtD for Human Computer Interaction (HCI) research that aims for designers within HCI to make knowledge and research contributions in dealing with ill-structured and wicked problems (Zimmerman et al. 2007). Even if RtD was introduced over 20 years ago, there is still no consensus on the terminology, concept or approach.

28 Other scholars (e.g. Torres 2010) employ the term "research by design" instead of "research through design" when referring to the same body of literature, e.g. Frayling 1993 and Findeli 2004. Similarly, design researchers with these kinds of considerations also discuss their work as practice-based research, or how the activities are driven or led, i.e. design-led and research-led, practice-led and practice-driven (see review on approaches in Rust et al. 2007), and discuss which mindset drives the activities (e.g. expert, participatory) (Sanders 2006).

cases. The approach is also very much aligned with studying infrastructures 'in-the-making' (Star and Bowker 2002) and infrastructuring (see Chapter 2).

Some design research scholars have criticized the RtD and CDR approaches for not offering methods or techniques for the very process of design (Bang et al. 2012, Zimmerman and Forlizzi 2008, Basballe and Halskov 2012, among others). These scholars have contributed to the development of these approaches by offering new models for RtD and the design work. For example, Zimmerman and Forlizzi (2008) suggest that a research question for RtD can follow two paths, first the "philosophical approach" deriving from existing theory and research. Here the inquiry happens through a process of creating artefacts. The second, "grounded approach", focuses on real-world problems and design proposals are situated to real-life contexts (Zimmerman and Forlizzi 2008, p. 43). In my doctoral project I apply the latter, grounded, approach in collaboration with stakeholders in the sites of digital cultural heritage. While doing this, I also make use Bang and colleague's (2012) work on the role of hypotheses in the constructive design research approach and its relationship to the design process and knowledge production. They argue that the hypothesis-making should be an on-going process in relation to the research motivation and context. "Hypothesizing is seen as an ongoing process that is framed by the overall research motivation for doing the research and developed in a continual process centered around the experiments conducted and in close articulation with the research question" (Bang et al. 2012, p. 6).

In the context of my doctoral research, I see this ongoing hypothesizing as setting out possibilities and contemplating on desirable futures (e.g. alternative views on current copyright regime, co-constructed and created cultural heritage), a process that is achieved in a collaborative and iterative manner through participatory design experiments. This navigation and contemplation takes place in a landscape of different, and often conflicting, motivations and political pursuits of the participants. A political motivation[29], (discussed in the section 3.2) has shaped my design research and design practice, something that I describe by taking on the label academic activist. This stance has formed over time, and it is theoretically informed and reflected through practice. In practice, in addition to the design research work, this orientation is manifested through advocacy and policy work

29 Bang et al. (2012) identify various "motivational contexts" of RtD, one of the six mentioned is political motivation, without a further definition.

(e.g. working with and through initiatives such as Creative Commons and Open Knowledge). Different interests and motivations can sometimes create tensions in design research processes. Recognizing these tensions and conflicting moves, and explicating and reflecting them, is a crucial part of rigorous and accountable design research. Similarly, as foregrounding designerly codes and patterns that vary in different design professions, motivations and interests of the academic activist should be identified and articulated.

The third pillar of my participatory research methodology is Action Research (AR)[30]. Action research is a practical research methodology that aims to produce new knowledge and develop theory through reflective practice by combining scientific and action inquiry. (cf. Greenwood and Levin 1998, Reason and Bradbury 2001). In its core, similar to PD, AR aims to change the current context of investigation (e.g. system, practice, environment). As with PD, the origin of AR lies in the workplace context. Applying AR in design research and practice is often advocated for within PD, and its influence for PD has been widely acknowledged within the field (Swann 2002, Spinuzzi 2005). In PD and AR alike, both the (design) process and artefacts are being shaped. According to Greenbaum and Loi (2012), in AR the point of departure is the needs and wishes of the participants, and researchers are supporting them with a view to meet the participants' and researchers' collectively shaped objectives. In turn, the PD approach brings "design-orientated work" into participatory research (Greenbaum and Loi 2012, p. 1).

In the 1940s Kurt Lewin coined the term AR and described it as "a comparative research on the conditions and effects of various forms of social action and research leading to social action" (Lewin 1946, p. 35). Lewin suggested a cyclical and iterative research approach where data collection and action would be intertwined. In my methodological toolbox, AR has three strategic functions. First, it helps understanding the phenomena and domain of digital culture and digital cultural heritage with an aim to collaboratively identify desired and preferable futures. Secondly, action in the form of design experiments and collaborative reflection drive the engagement among participants and, third, my own reflections and analysis takes the form of action through academic articles and political advocacy work, as well as ultimately this doctoral dissertation.

30 In some contexts and countries Participatory Action Research is used instead of AR.

In this type of participatory research strategy, knowledge production is embedded and braided into social action and creative activities (Greenwood and Levin 1998, Archer 1995). AR is carried out - similarly to PD - in partnership between researchers and people taking part in a collaborative research process. Routine AR processes have reiterative cycles of diagnosing, planning, action taking, observation, reflection and learning, as modeled by Susman and Evered (1978) (see history of AR Masters 1995, also Reason and Bradbury 2001, and AR for information infrastructures Baskerville and Wood-Harper 1996). Since its introduction this cyclical model of action research has been developed into various versions of a cycle by many researchers in different disciplines, while the core elements have remained the same. In short, in the *planning stage*, the shared objectives are set and the plan is developed accordingly. In the *action stage*, the plan is implemented, while recognizing a need for flexibility for adjustments that is achieved through observing and assessing the process and its outcomes. In the *reflection stage* of the process, the researchers and participants "analyse, synthesise, interpret, explain and draw conclusions" (Kemmis and McTaggart [1988] 2013, p. 86) In addition, critical reflection is carried out through theory.

AR has been seen as an important part of PD from its beginning, especially "in terms of attempting to change situations, not simply study them" (Robertson and Simonsen 2012 p. 36, 117). Increasingly AR methods are favored in PD research, and although from the surface they seems to share almost identical objectives, values and approaches, some PD scholars argue that even though they share similar interest in participation they are "quite different in their intent and purpose" and PD projects could benefit and build upon more on AR methodologies (Foth and Axup 2006, p. 93). For example, in traditional AR, research results are commonly shared among participants, while often in AR influenced PD, the research results are actions and experiments, not necessarily reports or research papers that could be easily distributed. These knowledge outputs are only useful if they are geared for action (Reason and Bradbury 2001).

In my work of co-constructing and contributing to cultural commons my knowledge strategy and aim has been to share research results among participants in various forms for different audiences (e.g. popularized research in a form of a booklet directed to GLAM professionals, an open and public research dataset for researchers, photos and videos documentation). Early sharing of ongoing design

research activities is also a conscious move in constructing common-pool resources for commoners and other stakeholders (see Article 5: Marttila 2016).

The Action Research cycle below (Figure 1) illustrates the research cycles for my doctoral research and the relationship I envision between knowledge production and action. The approach leans on a simplified traditional AR cycle (Susman and Evered 1978), combining it with elements of the methods for knowledge production found in the RtD tradition (Findeli 2010, Findeli et al. 2008).

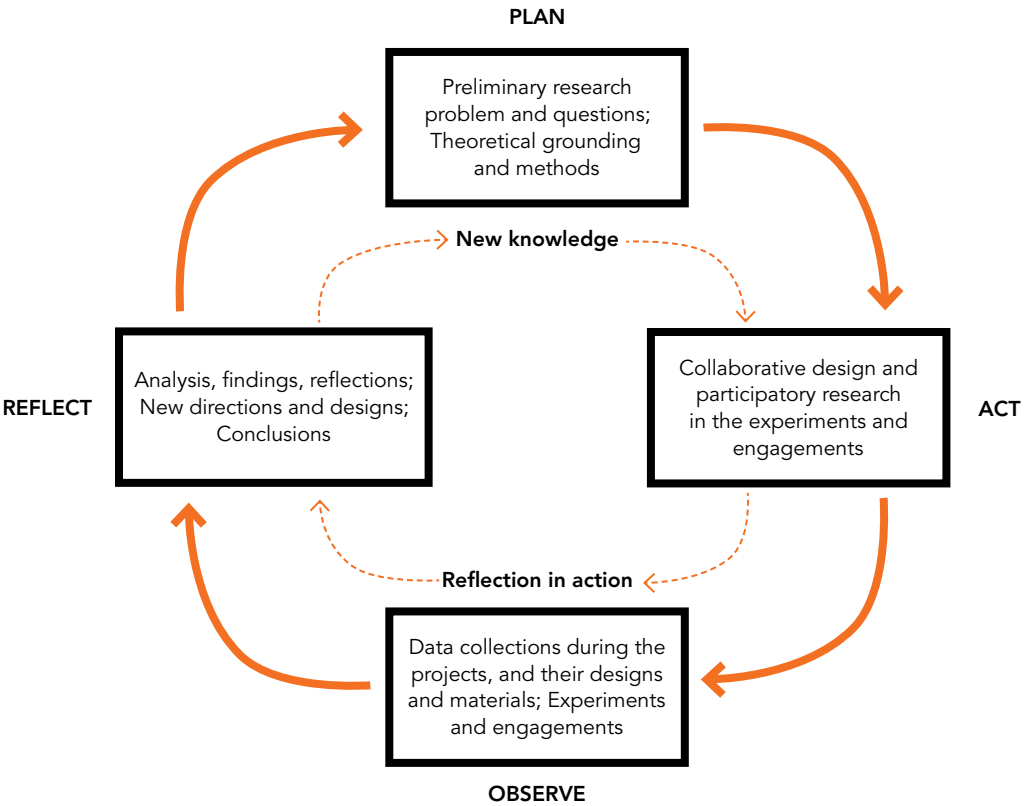


Figure 2. The envisioned Action Research cycle of the design research cases of my doctoral dissertation.

Perhaps a more realistic illustration of the design research journey, and of how the cases unfolded, would be Sanders' depiction of a fuzzy front end of a co-design process that begins with tangled ball of yarn that straightens as the concept development and design of prototypes and actual artefacts proceed (Sanders 2008). Nevertheless, I use the AR cycle to organize and communicate the research phases to be able to present the activities clearer. There are four phases of research and reflection in each of my cases. In both Fusion (Case 1) and EUscreen (Case 2) the co-design research process began by identifying and setting the initial research and co-design objectives, and setting the theoretical framework (PLAN).

As stated earlier, the overall frame and objectives for the P2P-FUSION and EUscreen project was set by agreements such as project plans and consortium agreements. Yet, there was room to develop research strategies for how to obtain empirical materials and engage with people in the projects. The fundamental objective in these projects from the co-design perspective was to study the current and emerging practices of the communities and/or cultural heritage institutions. Design researchers in the projects, myself among them, conducted fieldwork to understand these practices with an objective to design a technology platform to meet the needs and requirements of the stakeholders.

The planning phase of Fusion is discussed in more detail in Articles 1 & 6, and of EUscreen in Article 2 & 6. In AvoinGLAM (Case 3) the planning phase differed as the process was initiated with a co-design workshop, seminar and hands-on open culture hackathon with the aim of tracing and mapping opportunities and challenges from the participants inhabiting the field of study. In the context of Finnish cultural heritage institutions this meant probing issues that hindered opening their holdings and practices to a wider public. In turn, for practitioners such as artists, software programmers and designers the inquiry focused on understanding the creative re-use practices of open data and digital cultural heritage content. The research findings from the planning phase in AvoinGLAM are discussed in Article 5, and in Salgado and Marttila (2013) and Marttila and Sillanpää (2014).

In the second and the third stage (ACT & OBSERVE) the collaborative design processes were established, the participants were involved and their terms of participation were negotiated. The design experiments, arrangements and prototypes were also carried out in these phases, and insights were collected through e.g. field notes, interviews, and participant observations. The fourth phase (REFLECT)

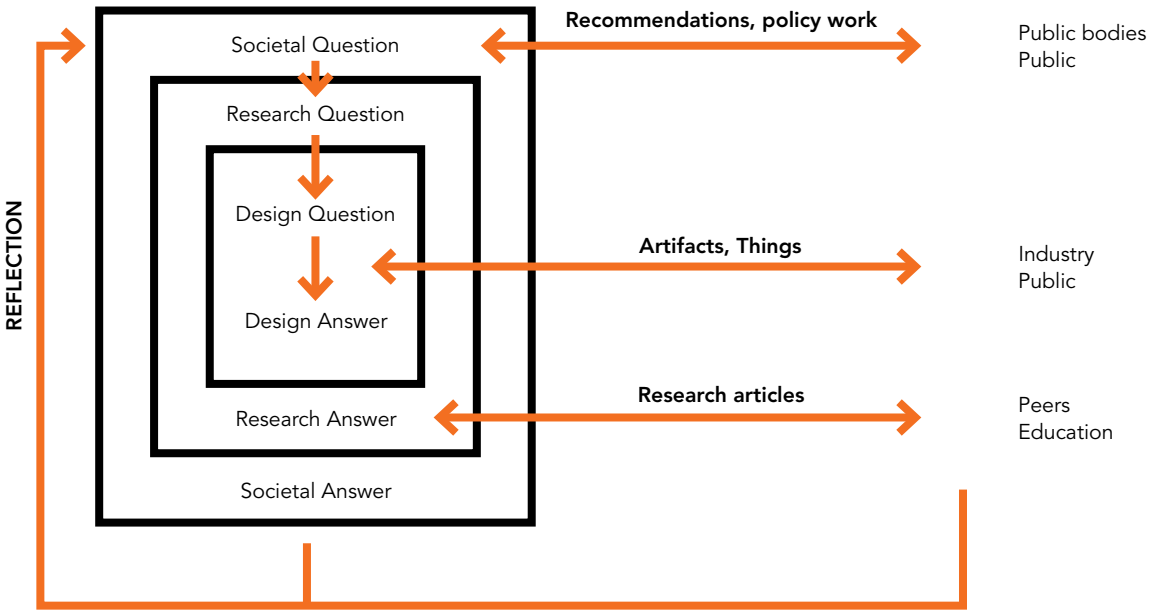


Figure 3. Research through Design process, and three levels of knowledge production. The illustration is built upon the original conception by Findeli (2010) by the author.

was the analysis and synthesis of the findings. Accordingly, after each case, the whole process was reflected upon and evaluated, and the new project or initiative was planned building upon the insights from the previous ones. The third initiative AvoinGLAM was planned to approach the field and the research area in an alternative manner – abandoning technology development as a starting point – to providing access to and support creative re-use of open digital cultural materials.

Sharing knowledge from design research projects that vary in scope and in approach is known to be challenging (cf. Brandt and Binder 2007), especially when catering knowledge production to different audiences. In the Figure 3 above, I combine the three research approaches that form my participatory research methodology: Research through Design, Participatory Design and Action Research, and the focus of knowledge production in each of these approaches. The illustration builds upon Findeli's (2010) original depiction of the RtD process and knowledge production through designing artefacts, but I have complemented it with some key insights coming from PD and AR.

An important and complementary part to AR deriving from the RtD approach is the acknowledgement that different knowledge contributions should be directed to different audiences. The appreciation of stakeholder participation and co-design, and collaborative knowledge production processes, visible in the figure, is in turn coming from PD. In Findeli's original thinking the two areas of knowledge production are separated – a *Research Answer* is directed for peers and education settings, and a *Design Answer* targeted to public and industry. When doing work as an academic activist researcher, it has been important to me to extend these areas to include knowledge production in the form of advocacy and policy work (added to Findeli's original graph by the author) and *Policy Answers* aiming to affect questions in societal and structural level in form of strategies and recommendations, etc. Similarly to Frayling's (1993) three modes of design research, design into, for and through for design, and what types of knowledge contributions they can produce to the field, these *Answers* are targeted to reach different audiences.

In the Table 4. below I have given examples of the different level of questions in the cases:

	Design question	**Research question**	**Societal question**
Fusion	How to design a peer-to-peer based portal for creative re-use activities for communities of practice?	What benefits and challenges there are in engaging everyday people in the co-design of a software toolkit? (Article 1)	How to enable citizens to use audiovisual materials in collaborative and creative ways?
EUscreen	How to design an online multilingual portal for distributing European television programming?	How copyrights complicate media and technology design? (Article 3)	How to facilitate and enable access to their audiovisual cultural heritage with new technological tools?
AvoinGLAM	How to design participatory activities that support and stimulate wider access to and creative re-use of digital cultural heritage in Finland?	What are the infrastructuring challenges and opportunities for open digital cultural heritage? (Article 5)	How to enable and support citizens' access to their digital cultural heritage by influencing the institutional policies, practices and regulations?

3.5 Research design and selection of cases

My research design is thus built on participatory research methodology, and in addition, I make use of data-gathering and conceptual approaches in the ethnographic research literature. I view the participatory and co-design activities through the lens of a developing case study approach where earlier cases frame the later ones, as I will show below. The research includes three individual design endeavors that each consists of multiple participatory design activities. These design research cases represent different aspects of the field of digital culture and digital cultural heritage. These individual cases consist of multiple field sites in various contexts that are selected, limited, defined, related and bound together by me – i.e. I have constructed the field of study. This approach that I have deployed in my doctoral research thus rests on the roles of design researcher and activist academic. As a participatory designer, I have engaged in various projects and endeavors, and through these design experiments, I have reflected on the academic significance of my engagement and on the empirical data I have obtained and produced.

The first case, Fusion (Case 1), was addressing real-life communities and their media practices related to digital culture and cultural heritage. In turn, the second case EUscreen (Case 2), was investigating cultural heritage and collecting institutions and their endeavors to enable a wider public access to their audiovisual archives. Building on the findings and lessons learned from the two previous cases, the third case, AvoinGLAM (Case 3), focused on both of these actors in the field – institutions and citizens – and aimed to bridge the two and co-construct and contribute to what I call a cultural commons. Additionally, AvoinGLAM aimed to apply an alternative design research approach to technology design perspective of the two earlier cases.

The first two cases, Fusion and EUscreen were part of interdisciplinary projects co-funded by the EC, and involved multi-professional consortia from various European countries. The two technology platforms aimed at either providing digital tools to creative activities of small communities, or/and at creating meaningful access to and facilitating appropriation of European archival audiovisual content. Fusion was targeted at helping communities of practice to share and create community media in their everyday life, and EUscreen is an access point for professional television programming coming from European broadcasting corporations and audiovisual archives. The projects evidently had multiple objectives and vari-

ous research outcomes in different research domains. In this doctoral dissertation, I focus on the collaborative and participatory design efforts that I conducted as part of these long-term research initiatives. Thus the unit of analysis is the participatory and co-design activities.

Even if the projects that developed these platforms were different – as I will elaborate later on – there were many similarities in the fundamental views and objectives of these endeavors. The core objective in both cases was to learn from pre-identified user groups' existing and emerging media practices, and to connect together and support the evolution of these practices in relation to the digital tools and services developed. The second fundamental objective was to stimulate and support people's emerging creative re-use activities on various levels (ranging from accessing media content to social enrichment and video remixing), and to develop open-ended infrastructures and software capabilities that could be shaped and further appropriated by the general public. Both of the technology platforms were designed for audiovisual collections, although the media files in these collections originated from different sources. In Fusion, the videos were mainly user and community-created, while in EUscreen professionals from various European audiovisual archives and broadcasting corporations curated the sub-collections from their holdings. Furthermore, the design approach differed in relation to how to develop a technology infrastructure: in Fusion the starting point was the communities and their existing media practices, while in EUscreen the infrastructural development stemmed from the existing archival audiovisual content in various such as audiovisual archives, public broadcasting corporations. Even if the point of departure and the design drivers were similar in these two technology design and development cases, as described above, the projects represented a very different viewpoint and arrangement (i.e. institutions, civic action) in the field of digital cultural heritage. These varying perspectives allowed me to engage with the different positions and point of views in my research design, and better to address the research questions of this doctoral dissertation.

The third design research case included in this dissertation, AvoinGLAM, is an open-ended endeavor that aimed at bringing together cultural institutions and cultural practitioners and at bridging their practices to create sustainable cultural commons. The two earlier cases and attempts to design for legal creative re-use and open and/or public access to digital cultural heritage had their limitations, which has been elaborated in the Articles 1, 3 & 6, and selected examples will be high-

lighted in the sections to come. In addition, the research findings from Fusion and EUscreen pointed to the need for more collective and open-ended orientations for approaching common history and cultural heritage online. These and other experiences obtained from my engagement with other design and research endeavors with digital cultural heritage sector (see e.g. Cordea et al. 2016) led to the initiation of AvoinGLAM. Taken together, these three experiences provide me with a broad view of the infrastructuring challenges for digital cultural heritage, and point to issues that I propose are central to the emergence of cultural commons.

The empirical inquiry undertaken in these three consecutive cases provides the basis for my doctoral work. I have applied a multiple case study approach that allows me to study in-depth a particular arrangement and phenomenon in the field of digital culture and/or digital cultural heritage. The case study approach, as I apply it, is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin 1984, p. 23). This type of research approach is considered to have been an "effective methodology to investigate and understand complex issues in real world settings" in various research disciplines where both qualitative and quantitative methods are applied (Harrison et al. 2017, p. 1). For my doctoral research the multiple case study approach, along with the participatory research methodology, has provided a possibility to address and analyze the phenomenon horizontally through multiple viewpoints. In design research, design activities are applied to understand a phenomenon, to develop a hypotheses, and to validate and test them (Teegavarapu et al. 2008). In PD research, case study approaches are widely adopted, although they are often framed as a unit of an analysis rather than a methodological strategy.[31] The case study approach complements, and is well aligned with my participatory research methodology, as these approaches all rely on being in the field in real-world settings and allow me to investigate the phenomena in-depth in contexts.

Even if the three cases are different, put together this multiple-case and multiple-site approach has allowed me to examine the phenomenon and follow the development of the field of digital cultural heritage over a long period of time – nearly ten years – collecting data from multiple sources and from multiple perspectives. The

31 In the Participatory Design Conference proceedings there are over 60 articles framing their unit of an analysis as a case. See http://pdcproceedings.org/.

three cases with different settings in the field made possible a more holistic design research approach, and provided insights to divergent viewpoints from which real-life actors look at the research problems I have outlined in Chapter 3. Analyzing and synthesizing these perspectives together allows me to develop and discuss infrastructuring strategies for digital cultural heritage, and explore how to contribute to the construction and sustainability of cultural commons. In addition, by implementing a multi-case study approach, I can better consider the challenges that contemporary PD is facing when operating in collective and commons-based frameworks.

There are some limits worth mentioning in relation to the case study approach in relation to validity and relevance of the knowledge produced. For example, Halperin and Health (2012) argue that a generalized validity is not possible with a case study approach, but the generalizability could be strengthened by referring the cases at hand to other previous cases. Other scholars suggest that the rigor and accountability of these kinds of design research projects could be evaluated against the real-world relevance and reusability of research and design contributions (Zimmerman et al. 2007). For my doctoral research the justification of this research strategy derives precisely of the aim to pursue of real-world relevance, and from the usefulness in practice.

The research design of the exploratory multiple-case study is rooted in the theoretical framework presented in Chapter 2. This provides an orientation and a sounding board for my research activities. I am exploring and combining theory deriving from the commons research tradition and studies on information infrastructures and infrastructuring, and *after* experiments and observations, I propose my theoretical contribution. While descriptive case studies address and aim to describe the phenomena, exploratory case studies, which I use in this thesis, explore phenomena found in and through the empirical materials. This opens up new directions for further study while a phenomenon is observed and data about it is collected, and allows the research hypothesis and question to be developed during the fieldwork. The empirical materials and data included in this dissertation are collected through applying both qualitative and quantitative methods. The unit of the analysis has been participatory events, arrangements and experiments, and I have obtained the data in direct observation and through engagement from the three individual design research cases that I will describe more in depth in the following sections. The general list of participatory and co-design activities and data gathered for these instances are presented in Tables 4-6, and discussed in length in Articles 1, 3, 5 & 6.

3.6 Design research cases: Fusion, EUscreen and AvoinGLAM

In the following sections, I will describe and discuss each of the cases in chronological order, and present how empirical materials and data were obtained in each of them. I start with the two of the cases, Fusion and EUscreen, which were about collaborative design and development of two technology systems for digital audiovisual cultural heritage, as they represent the two sides of the gap I am aiming to bridge as part of my doctoral research. The third case, which consists of my attempt at an approach and a 'solution' through nurturing, contributing to and sustaining a cultural commons, is more cultural than technological in that it is a long-term engagement with a social cultural movement in Finland over the period of four years. This section is a summary and overview of the cases and the activities undertaken within them. A more detailed account of design experiments, empirical materials and analysis can be found in the original research articles.

To provide signposts to the reader the illustration below (Figure 4) locates the design cases in relation to two entities: everyday culture and institutional cultural heritage and the attempts to bridge them through different designs and experiments.

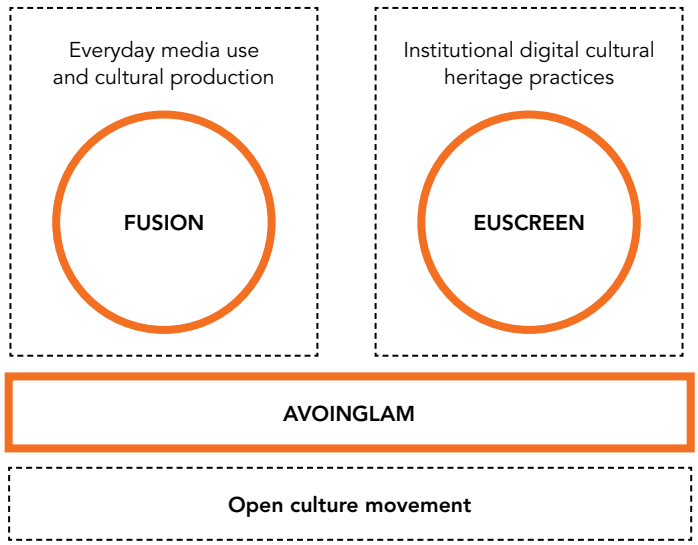
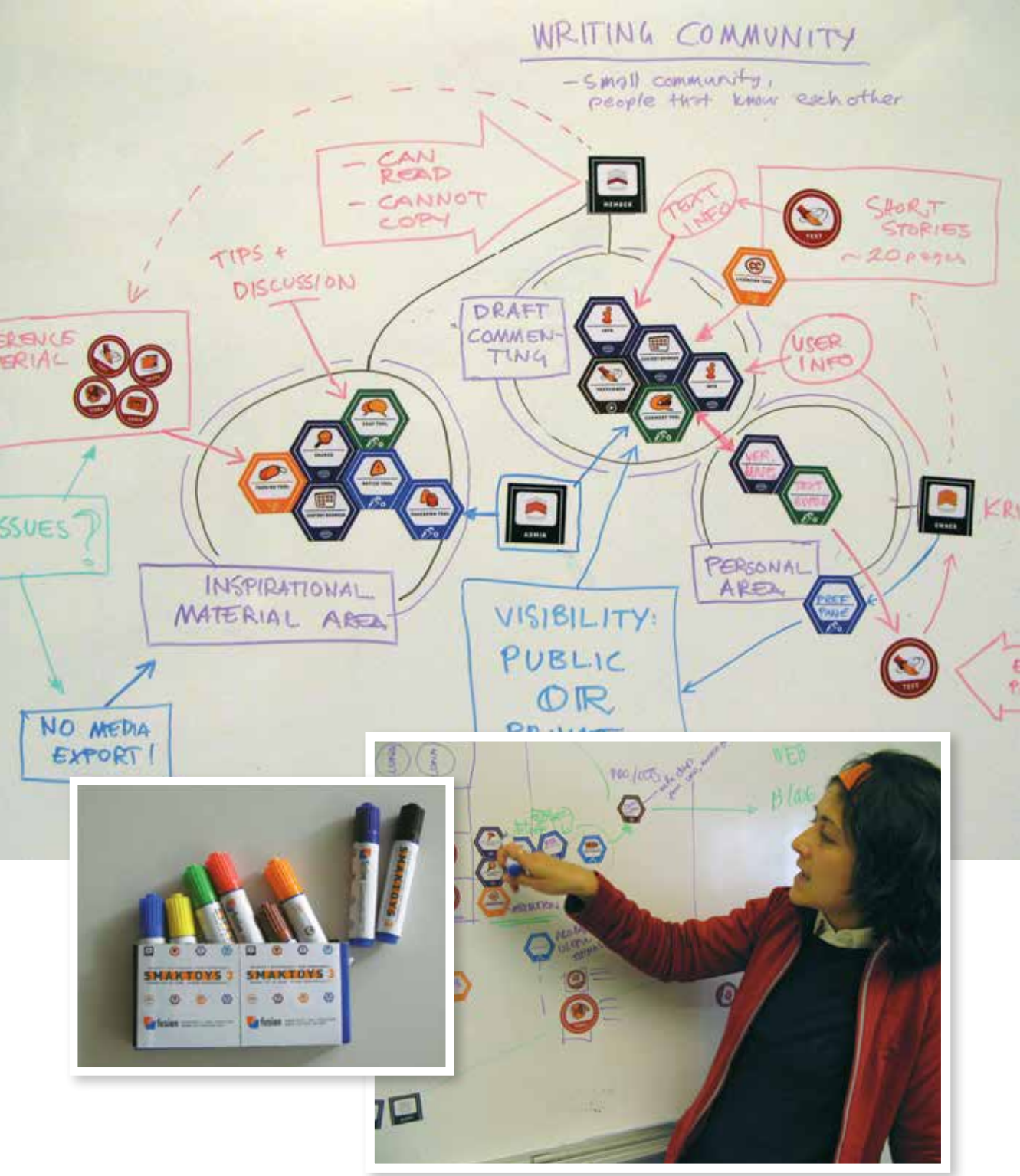


Figure 4. Illustration of the three design research cases, Fusion, EUscreen and AvoinGLAM and my positioning of them in the digital cultural domain.



The project team at TAIK (now Aalto ARTS) designed a collaborative design tool called the SMAK Toys for the Fusion co-design workshops. The SMAK Toys is a set of about 30 magnetic cards that represent different media practices and types of content. The cards intended to facilitate the creation of shared vocabulary and common understanding about community's media practices, and serve as a strategy for translating these findings into design of a component-based software toolkit. Photos by Arki Research Group.

3.6.1 The Fusion system for facilitating everyday media practices of communities

Fusion was an experimental peer-to-peer audiovisual file-sharing system for communities of practice, built for sharing their everyday creative activities. With Fusion, communities could manage, distribute and archive their media in a peer-to-peer (P2P) network, and create customized social media applications for their needs. The platform was developed as a part of a three-year research project P2P-FUSION (2006–2009) co-funded by the European Union. This multidisciplinary research project had ambitious objectives: Firstly, it aimed at providing support for communities' social activities and media practices by encouraging the creative re-use of audiovisual content in their everyday activities, specifically collaborative sharing, editing and enriching of videos, and providing tools for such activities. The second objective was to provide inbuilt software toolkit capabilities that would enable the development of social media applications, or the customization of existing applications to meet the needs of communities' particular practices. Thirdly, the project aspired to foster a conversation about finding solutions to various intellectual property rights (IPR) issues related to copyrights and the legal re-use of audiovisual materials.

In terms of technology, the Fusion system aimed to connect a number of technology layers: A peer-to-peer network for decentralized storage and distribution of media files; a distributed metadata layer with several social-processing and enrichment features (e.g. annotations and recommendations); an embedded licensing procedure for the content that utilized the *Creative Commons* licensing framework; and a *Social Media Application ToolKit (SMAK)*, which included components that end-users could combine to create their own social-media applications. These were Fusion's main software components and were prototyped and used throughout the lifespan of the project, and have been integrated into other systems and infrastructures. The Fusion system itself, however, is no longer available.

The design and development of Fusion was carried out by the project consortium[32], in collaboration with selected user groups and communities (referred to as

32 The project consortium had six partners: Helsinki University of Technology, Technische Universiteit Delft (TUD), Budapesti Muszaki Es Gazdasagtudomanyi Egyetem (BME), Stichting Nederland Kennisland (KL), Stichting Nederlands Instituut voor Beeld en Geluid (BandG), Neumann Janos Digitalis Konyvtar Es Multimedia Kozpont Kht (NEUMANN) and the coordinator University of Art and Design Helsinki (currently Aalto ARTS), which I was part of.

content communities within the project, and in this dissertation). The co-design activities focused on in-depth understanding of the communities' wishes and on practices related to audiovisual media sharing in Finland, Hungary and the Netherlands. The design involvement in the project related mostly to the participatory design efforts, especially those for the SMAK toolkit, as this was Fusion's main interface with end-users. I had two main roles in the P2P-FUSION project, a designer and project manager. The collaborative design partners, participants and other stakeholders took part in various continuous, programmed interactions (e.g., interviews, design tasks, workshops).

Table 4 provides an overview of the main co-design activities and empirical materials that formed the basis for my doctoral research. All these events listed in the table were recorded on audio and/or video, and the resulting design artefacts were documented through photographs, screen shots, and use observations. In addition to the materials obtained through these specific co-design engagements, empirical data was collected in the form of field notes that were shared with the whole project consortium. In the case of the SMAK software development, we also made use of the discussions in the issue tracker, in which notes are logged about e.g. software bugs and problems in use, and in the project's wiki documentation platform. Fusion aimed to enable legal creative re-use of audiovisual materials, and hence issues related to copyright and intellectual property were discussed within the project and in a public blog.

The content communities were the starting point for the development of Fusion, and therefore a lot of effort was invested in understanding the communities, their history, and the current and emerging media practices within them. The involvement of the communities as co-design partners was carried out in three phases: First, we conducted a mapping of possible content communities, in order to list promising co-design partners and to obtain a more profound understanding of their current community media content and their practices online. The identification and selection process began with benchmark of potential content communities in Finland, Hungary and The Netherlands. For this the project partners systematically mapped and documented the characteristics of different communities. After coding and analysis, the work resulted a repository of standardized descriptions (a Community Quick Scan document) of over 30 different communities. The document provided a quick overview of the various conditions, and the process itself offered insights e.g. to the community structure, social practices and the types of media they use and

Table 4. Overview of the design research and collaborative design activities and experiments in the P2P-FUSION project conducted in three different countries: Finland (FI), Hungary (HU), and The Netherlands (NE). Original table is from the Article 6: Marttila and Botero 2017.

Activity	Participants and collaborators	Design research artefacts/ experiments
[A1] Identification and mapping of content communities (FI, HU, NE)	Project partners 33 identified content communities	Scoring criteria Overview data-sheet and selection table Community web presence Community Quick Scan
[A2] Selection of and invitation to content communities (FI, HU, NE)	15–20 community representatives Project partners	Semi-structured interviews Scoring criteria
[A3] Information Days (3) (FI, HU, NE)	20–30 community members Project partners	Scenarios Use cases Media Inventories
[A4] Local co-design workshops SMAK (~15) (FI, HU, NE)	3–5 members from each community (8 communities) Design team: 3–4 members	SMAK Toys kit (a design game) Paper prototypes Mash-up examples Scenarios Communities' own media Community Application Concepts
[A5] International co-design workshops SMAK (2) (HU, FI)	3–5 members from each community (3 communities) Design team: 3–4 members	SMAK Toys kit Functional SMAK prototypes: Community TV, Jose, Family Archive, Gallery Paper prototypes Scenarios
[A6] Developer workshops (2) (FI)	~7 external developers and 3 Fusion developers	SMAK Toys kit Scenarios Fusion code and prototypes WebBridge
[A7] Co-design and validation projects (2) – Education and Archive integration (HU, FI)	~25 students 4 teachers ~ 18 youth-club members ~2 youth organizers Project members and Fusion design team	Fusion prototype Publishing server Archive Material Video Essay assignments Interviews Questionnaires
[A8] Co-design and validation experiments. (1) – Archive integration. (NE)	Project members, archivists and cataloguer, 1 Fusion developer	Fusion prototypes and proof-of-concepts Archive Material

The Fusion educational workshop was organized in Budapest, Hungary. Altogether 45 students and teachers from four different high schools engaged with the Fusion software and tested the educational pilot application. Before the actual workshop the schools were asked to prepared materials and videos on the topic "scandal" to interpret and reflect on the theme and its history. To enrich their video essays the students combined them with archival audiovisual materials provided by the National Audiovisual Archive of Hungary. Photos by Arki Research Group.

The P2P-FUSION project's co-design process aimed at understanding and mapping participating communities' media practices, needs and ideas in ways that could inform the development of the Fusion software. In the co-design workshops the project team (researchers, interaction designers and software developers) and the community members engaged in participatory design activities, producing further insights of media practices, as well as design ideas and concepts for community applications and pilots. Photos by Arki Research Group.

share [A1,2,3]. After the community identification and selection, the next phase was the co-design phase that in the project referred to the iterative design and development approach, where members from the selected communities, who are not necessarily professionals in design, are actively engaged in a design process. In the second phase of the community engagement we expanded the collaboration with some of the selected communities, and they participated in co-design workshops, created scenarios and paper prototypes, and used demos and prototypes of the social media applications built specifically for them with Fusion [A4,5,6,7]. The main objective of this part of the co-design was to identify communities' needs and develop Community Applications Concepts – a plan outlining key functionalities and features – together. The process culminated in iteration on the needs into functional specifications and application concepts (i.e. main use cases). Furthermore the co-design activities and concepts were consolidated into three pilots: Educational, urban and distributed editing pilots, which were ultimately implemented in the form of Fusion prototypes. In the third and last phase of the co-design process, when a more developed software base already existed, the emphasis was on validating some more advanced and specific use scenarios for Fusion via concrete proof-of-concepts. These later forms of engagement also included an exploratory project, experiments, and proof-of-concept demos. These prototypes were validated and evaluated by the community representatives and external user groups [A6,7]. Afterwards the participants were asked to fill-in a questionnaire and review their experience and the software, short semi-structured interviews were also conducted.

During the co-design process the empirical materials and data were analysed and assessed in rigorous manner, and formulated and synthetized in to e.g. internal thematic reports, design specifications, functional analysis', and published deliverables (e.g. Evaluation reports for EC). Article 6: Marttila and Botero 2017 in this dissertation, discusses the co-design process in detail as well as the co-design partners in each phase. In addition, the article casts light on the methods used to collect the empirical data.

In addition to the co-design engagement with the content communities, we, the team, designed tools to aid and mediate the collective design efforts. One of these tools we called SMAK Toys. It was designed to facilitate the co-design sessions' efforts to achieve a shared vocabulary and understanding with the participating communities. This toy-like design game was made to address the complexity of the software being designed, the fact that most of the content community

members had not participated in software development before, and that some had only limited experience of new digital technologies and social media. SMAK Toys used magnetic cards to represent different types of media content and different ways to share it. Some of the magnetic cards were left blank, so new or missing usages could be included. The individual cards functioned as 'building blocks' that created a common understanding about media practices. At the same time, they turned into a strategy for how the building blocks could be translated into the design of the component-based software toolkit SMAK. After the first workshops that focused on mapping current and future media practices with the SMAK Toys designers, software developers and the content community representatives created scenarios and paper prototypes to provide further information on the communities' media practices as well as concrete design ideas regarding media applications. With the help of the project team, the community members created and wrote down one or two scenarios, which described potential media-sharing situations for the community (e.g. sharing of photos and videos of a community event such as Parkour Jam). (See Article 1: Marttila et al. 2011 for a more detailed account of the co-design process for Fusion and SMAK).

3.6.2 EUscreen – access to institutional audiovisual cultural heritage

The EUscreen portal (http://euscreen.eu/) promotes the access to and use of television cultural heritage, enabling users to explore Europe's rich and diverse cultural history. The technology platform allows multicultural and multilingual exploration of European television content and metadata, and encourages audience engagement with the offerings. The audiovisual collection made available for EUscreen is curated by archives and national broadcasting corporations across Europe.[33] The

33 The content providers in EUscreen were British Universities Film and Video Council, Česká Televize, Danish Broadcasting Corporation, Deutsche Welle, Hellenic National Audiovisual Archive, Institut National de l'Audiovisuel, Radio Telefis Eireann, Istituto Luce, Memoriav, Neumann Janos Digitalis Konyvtar es Multimedia Kozpont Kht., Netherlands Institute for Sound and Vision, Österreichischer Rundfunk, Telewizja Polska, Slovenia TV archives, Televiziunea Romana, Radio-Télévision Belge de la Communauté Française, Kungl. Bibliotek - Sveriges nationalbibliotek, Televisio de Catalunya, Vlaamse Radio- en Televisieomroep and Radiotelevisione Italiana Spa.

portal[34] presents the content thematically, (for example as belonging to the theme "Arts and Culture", or "Conflicts"), and according to genres, for example News), and includes broad metadata for the media, (such as the broadcast date and geographical coverage)[35]. The EUscreen platform aims to support, on the one hand, multi-professional collaboration (across memory institutions) and, on the other hand, the creative audiovisual re-use activities of various user groups. To achieve these aims, the EUscreen project (2009–2012) adopted a co-design approach with various stakeholders in three main areas: defining and building a digital online audiovisual collection to populate EUscreen; designing a technology platform and its offerings; and understanding and supporting the emerging practices of creative re-use. The fundamental aim of the project was to pool a digitized collection of European television programming. Even if, at the time, some digitized materials were available online, access to audiovisual archives was scattered. The objective was also to engage and collaborate with users and practitioners in varying contexts such as research, learning, leisure and creative re-use, all in order to develop scenarios for novel services and content (EUscreen 2009).

Table 5 (below) thematically summarizes the main co-design efforts and design research activities that form the EUscreen case for my doctoral dissertation. It should be noted that, for the purposes of this dissertation, I concentrate on the early design and development work on the first beta version of the EUscreen platform, since the key decisions related to infrastructuring were taken at that time and were therefore most relevant for my doctoral research project. In terms of technology development, my analytical focus covers the launch of the first public beta version of the platform and various parallel experiments carried out around it.

34 The EUscreen portal was developed within two EU-supported projects: 1) the EUscreen project (2009–2012), whose main objective was to design and develop the portal and produce an audiovisual collection of European television history. In the beginning the project had 28 partners, comprising content providers, technology developers and research partners; 2) the EUscreenXL project (2013–2016), which continued the development work, launched a new responsive interface and enlarged the audiovisual collection. At the moment EUscreen is maintained by a foundation.

35 Currently the EUscreen portal makes publicly available a wide collection of over 60 000 items of television programming, and over 1 million metadata records of more than 20 audiovisual archives and public broadcasting companies throughout Europe. Besides being a stand-alone platform, EUscreen is also the largest provider of audiovisual heritage to Europeana.eu (an interface for digitized European cultural heritage providing access to currently over 50 million records of digital culture).

The Open Video Make Session was organized as a part of the *Open Culture and Science Hackday* at *Open Knowledge Festival*. Around 10 experts from different fields were invited to open up video as an exploratory medium. The aim was to obtain new ideas and inspiration on how video characteristics could be explored and transformed into something more than an ordinary video clip online. Photos by Ramyah Gowrishankar, Kati Hyyppä, Sanna Marttila (CC BY-SA 3.0).

Table 5. Summary of the design research and collaborative design activities and experiments in the EUscreen project in thematic order. Original table is from the Article 6: Marttila and Botero 2017.

Activity	Participants and collaborators	Design research artefacts/ experiments
[B1] Definition of user groups and mapping of initial user requirements	Project partners Various invited collaborators	Pre-existing knowledge Initial functional requirements
[B2] Scenario Framing.	12 Field experts ~8 selected future stakeholders (e.g. teachers)	Use and user scenarios around research and leisure/cultural heritage and open cultural production
[B3] Scenario evaluation and testing in real-world settings	38 participants (from 7 different countries during one month) Project partners	Semi-structured interviews
[B4] Mapping possible content and understanding archives' existing intellectual property and rights situations	17 respondents from audiovisual archives and public broadcasters Project partners	7 Future-use scenarios Online survey design and results Audiovisual (AV) content samples
[B5] Mapping of open audiovisual content	5 representatives from archives and public broadcasters	Structured interviews AV content samples
[B6] Co-design workshops (3)	8–40 participants 2 Researchers	EUscreen Wireframes Paper prototypes Visualizations
[B7] Collection design (AV content selection)	Project partners (audiovisual archives and public broadcasters)	Future-use scenarios Copyrights/terms of use clearance Content-selection guidelines AV content samples
[B8] Collection experiments and testing (AV content selection)	Project partners (audiovisual archives and public broadcasters) ~10 selected future stakeholders	Open Images prototype Virtual Exhibition prototype Content selection guidelines AV Content samples
[B9] Co-design and testing workshops (2)	12–15 Students 3 Researchers	EUscreen Portal Virtual Exhibition builder prototype Thematic Virtual Exhibitions
[B10] Open cultural production workshops (3) a. License to Remix, b. Make Open Video, c. Linking Media Workshop	a. 11 young adults / 3 external experts / 2 video & VJ practitioners b. 10 designers, developers and artists c. 30 Students / 1 teacher 2 Researchers	Rehearsing practice exercises AV content samples Mash-ups and video remixes Audiovisual compilations Interviews

From the beginning, the EUscreen project plan defined four very broad thematic areas of application for EUscreen: education, leisure, research, and open cultural productions. These themes were selected when the funding application was made and were based on previous collaboration by the consortium partners. The first phase of the project included refining and concretizing the characteristics and requirements of possible user groups and communities in relation to these thematic areas. Use-case narratives collected from all project partners' previous experiences formed the bases for the initial functional user requirements made for the front-end development of EUscreen [B1]. Through further engagement with the selected user groups and stakeholders, the design team together with co-design participants created several use scenarios in the four thematic areas [B2]. To probe and validate the relevance of these use scenarios, evaluation sessions were held in a number of European countries, using the same questionnaires, interviews and assignments. [B3].

In order to build the audiovisual collection for EUscreen, and to clarify the possibilities for creative appropriation and re-use that the portal was planning to offer its users, a survey of intellectual property rights was carried out with the content providers, i.e. the participating archives and public broadcasters [B4]. The survey contained questions about the content selection and copyright-clearance process of each organization involved. This helped us to understand the scope of the rights and the terms of use of the material made available for EUscreen. Importantly it also conveyed what kinds of creative use activities future EUscreen visitors envisioned doing with the EUscreen content. (See Article 3: Marttila and Hyyppä 2014a) for a detailed account of the survey and its design implications for EUscreen). As it turned out, a large part of the available content had a lot of and different copyright limitations, which meant that many of the envisioned use scenarios were impossible to realize. Some of the institutions that indicated in their responses an interest in and possibilities for releasing materials for EUscreen under more flexible and open copyright terms were invited for further interviews and exploration [B5]. With the first working versions of the portal and a clearer idea of the concrete possibilities for supporting creative re-use with future EUscreen content, several co-design workshops were held to develop the main features, and to continue testing the developed concepts and scenarios [B6,7].

In order to deepen our understanding of the challenges involved in creative re-use of online archival audiovisual materials, the project adopted a practical and

Photos by Kati Hyyppä and Sanna Marttila (CC BY-SA 3.0).

The EUScreen educational workshop was organized at a high school in Helsinki in collaboration with the National Library of Finland. The workshop was part of the high school students' history course titled "European People". About 30 students worked in small groups investigating the topic of their course using audiovisual materials found through Europeana, combining them with other online sources.

The License to Remix! participatory video remix workshop was organised in collaboration with The City of Helsinki Youth Department. The aim of the one-weekend workshop was to study and support creation of audiovisual remixes and mash-ups using existing video materials online. The participants were mostly students in their 20s without previous experience in video remixing. The workshop was facilitated By Andrew Gryf Paterson, Kati Hyyppä and Sanna Marttila and supported by VJ PHOQ and video editing expert Ilpo Kari.

design-oriented perspective. This included designing experiments, making prototypes and staging events with the aim to inform and provide design implications for future EUscreen technology and probe possible future directions. To experiment with and to pilot open distribution of audiovisual cultural heritage, a section was created on a separate video hosting platform, Open Images. In this platform, five of the content providers in the project released a selection from their video collections with a Creative Commons license [B8]. The project also created an experimental EUscreen prototype that allowed for combining and linking EUscreen content from different institutional collections spanning different historical periods. The prototype, called the Virtual Exhibitions (VE) builder, was, as the name suggests, a tool for curating and creating virtual exhibitions to be displayed in the portal. The prototype was designed and developed in close collaboration with user groups and participant institutions [B8,9]. The VE builder team documented the process and its different phases, and the materials from each phase were analyzed and synthetized into report summaries that were shared amongst the participants and project members.[36]

In the last co-design phase, we engaged with domain experts from the culture heritage and learning sectors (e.g. with curators, teachers), open culture practitioners, and selected user groups representing the different areas of interest to EUscreen – the fields of research, learning, leisure and open cultural production. All of these groups and individuals were deemed potential beneficiaries from using online archival audiovisual content and creative tools of the type that EUscreen could have in the future. In the same vein, all the exchanges provided opportunities to identify ways in which future EUscreen developments could enable and support emerging creative activities, as well as supporting the advanced digital archiving of video. The design team conducted three case studies centered on open cultural production practices, and gathered empirical material using participant observation and interview methods while letting participants experiment with the workshop themes [B10]: First, *A License to Remix!* – a participatory video remix workshop – which studied current and emerging audiovisual remix and mash-up practices among young people mainly in their early 20s. One of the central objec-

36 The VE builder was developed by Noterik and Aalto University in collaboration with other EUscreen consortium partners. The co-design process was led by interaction designer Kati Hyyppä.

tives was to understand the challenges involved in legal remixing, and to find ways that EUscreen could enable and support such legal practices. (For more details of the study see (Marttila and Hyyppä 2014b). Second, the *Make Open Video* workshop invited advanced users and experts to create experimental interactive videos that went beyond traditional remixing by including open data and other not so widely used video features. Our aim was to study how practitioners were making use of video and metadata, and to develop ideas about how EUscreen could support expert users. Third, the *Linking Media* educational workshop was held in a high school as a part of a history course. The workshop aimed at helping high school students to learn, as part of their curricula, about and deepen their knowledge of European history by creating rich audiovisual compilations that linked cultural heritage material to other sources, as well as at supporting students to share these collections and stories online with others. The design objective was to study how students would undertake and approach these tasks, and generate material for developing design solutions that would support student practices. These co-design activities and other qualitative research outcomes (e.g. audiovisual recordings from semi-structured interviews) were analyzed by following standard principles of qualitative research (cf. Silverman 2011). For example the participants' interviews were analyzed through open coding, and written summaries/reports were produced. The co-design workshop materials and participant observations (e.g. paper prototypes, field notes, hands-on exercises) were reflected and synthetized as a form of evaluation and analysis report. Articles 3 and 6 discuss and describe in greater detail the EUscreen case, the co-design activities and experiments undertaken, and how empirical materials were obtained.

3.6.3 AvoinGLAM – an open cultural movement

The third case, AvoinGLAM, ("avoin" means "open" in Finnish), is less technology-focused than the previous two, as it consists of my long-term engagement, over four years, with a value-driven cultural movement in Finland. The purpose of the case is to examine how participatory design efforts, when centered on culture rather than technology development, can contribute to my dissertation goals of strengthening interaction and participation in commons-like frameworks in the cultural field, and how infrastructuring strategies can support the emergence of commons culture. The two first cases, Fusion and EUscreen, were tightly struc-

tured around funded research and technology development projects, with formal decision-making procedures as well as pre-defined project plans and partners. AvoinGLAM was from the beginning a fluid and open-ended initiative without 'traditional' management practices, hierarchy or success indicators. That said, the AvoinGLAM case, as described here for the purposes of my doctoral dissertation, is a combination of two funded projects and network activities. I was also responsible for structuring and conducting the data collection.

The international OpenGLAM initiative was launched at the end of 2011 (see also Baltussen et al. 2013), and it became an initiative of the Open Knowledge Foundation (now Open Knowledge, OK).[37] The aim OpenGLAM is to "promote free and open access to digital cultural heritage held by Galleries, Libraries, Archives and Museums." Soon after OpenGLAM was established, actors in different countries founded local independent sections or sub-groups focusing on local stakeholders, agendas and digital cultural heritage collections. These local organizations are not hierarchically linked to the OK organization, but share at least some common aims with it. One of these is AvoinGLAM, which I initiated in Finland in the spring of 2012.[38] In practice, its inauguration meant purchasing a domain name and setting up a website by a small team. From the beginning the mission of AvoinGLAM was to support Finnish cultural institutions to develop more open and transparent work practices and organizational cultures as well as to open-up data and content for a wider public use. AvoinGLAM continues to develop meaningful public access to open cultural content, and to stimulate re-use of such digital cultural artefacts by various actors in different domains in the society.

37 Many individuals, organizations, projects and networks (e.g. LODLAM, Creative Commons) had worked towards open culture, and the aim of OpenGLAM was to provide an umbrella network for such activities and engaged people. Today, OpenGLAM is also a global network (not limited to its institutionalization in OK) of people and organizations aiming to open content and data held by GLAM institutions. In addition, OpenGLAM has a working group that is advised by an international group of experts. The publicly most known and visible part of the movement is the active OpenGLAM mailing list and openglam.org.

38 The organization benefitted from my previous experiences from practice and design research literature, especially the initiatives stemming from work done in Medea – the former collaborative media initiative in Malmö University (e.g. Ehn 2008, Björgvinsson et al. 2010, 2012a, Hillgren et al. 2011, Löwgren and Reimer 2012, Lindström and Ståhl 2014), paved the way for non-projected and non-object centered design, and encouraged to apply the AvoinGLAM case.

At the beginning AvoinGLAM was linked to Aalto University ARTS, because of my work position there, and the core of the initiative was formed by a small group of likeminded people from different research and cultural heritage institutions[39] (see Marttila and Sillanpää 2014). Initiating AvoinGLAM in the university was a conscious choice for ideological and practical reasons: universities (should in my personal opinion) represent the idea of free/open knowledge, and for me as a founder it was important that the initiative would not be tied only to a person but also to an institution. On the practical side, I worked at the university and could secure some seed funding to establish the initial social and technical infrastructure for the group to build upon.

In addition to my personal political reasons there was a practical reason for bringing various Finnish cultural institutions and other actors together, because Open Knowledge was planning to host their annual festival in Helsinki, Finland. One part of the festival, which hosted over 1000 people, was a track for Open Culture and Science that aimed to promote both the opening-up of digital cultural heritage materials held by institutions, and explored ways of utilizing and appropriating these materials. I was part of the international working group organizing this track, and from this spawned the idea for a local OpenGLAM network. The working group organized a seminar aimed at cultural institutions, and a hack-day aimed at practitioners and appropriators of open data and materials [C1 in the Table 4]. Officially, AvoinGLAM was launched at this seminar, which was titled "*Towards Open Culture and Art*" and targeted at Finnish art and culture institutions. In addition to the launch of the AvoinGLAM initiative, the event served as a platform for mapping and understanding the current state of open culture activities and projects related to open culture in Finland, as well as for institutions to voice the challenges and obstacles they faced in opening their digital holdings for a wider public.

From the beginning, the mission of AvoinGLAM has been to support cultural and memory institutions in opening up data and content from their collections, as well as to support the development of more open and transparent work prac-

39 The initial group setting-up and planning the first seminar included Mariana Salgado (Universtiy of Art, Design and Architecture), Tapani Sainio (The National Library of Finland), Tove Ørsted (Society of Swedish Literature in Finland) and me. In addition my colleagues Kati Hyyppä and Ramyah Gowrishankar were part of the AvoinGLAM group.

tices and organizational cultures in such institutions. In addition, AvoinGLAM advocates open and public access to cultural content and stimulates the re-use of these digital cultural heritage artefacts. The first version of the mission statement and objectives were written by me for communication purposes and as a way of building the base infrastructure for the organization, and were published on both AvoinGLAM and Open Knowledge Finland websites.[40]

In practice, AvoinGLAM can refer to two different entities: the AvoinGLAM movement and network, and the AvoinGLAM working group. The latter is a group of active members that take initiative to work on a specific task or a project. This institutional arrangement was set up in the beginning of 2013, soon after the establishment of the local chapter of Open Knowledge in Finland. During the past four years, the AvoinGLAM initiative and network has evolved and organized different activities, such as events, projects, courses and advocacy work. By now, the participants in the network are difficult to count, as we do not have a formal membership, nor do we track the people who have participated in our events. Participants come from various segments of society (e.g. representatives from GLAM institutions, universities, public institutions, and practitioners and professionals from various fields, and covering most of Finland. However some indication of the reach of the Finnish GLAM movement can be gained from our public Facebook group, which has approximately 350 members. AvoinGLAM has also had three projects that have been largely funded by the Finnish Ministry of Culture and Education, and co-funded by the Aalto University and various culture and memory institutions. In both of these projects, *Towards open culture* (2013—2014) and *AvoinGLAM* (2014—2015) I have been the principal investigator and initiator of the funding applications, and afterwards I have led the projects and have ultimately been responsible for their design and implementation[41].

In order to present the AvoinGLAM activities in the form of a design case, I parcel the participatory and co-design activities into four phases: Foundation building, creating a shared knowledge base and resources, framing conditions for creative re-use, and lastly fostering and sustaining cultural commons. Table 6 be-

40 Visit http://avoinglam.fi/ and https://fi.okfn.org/ for more information.

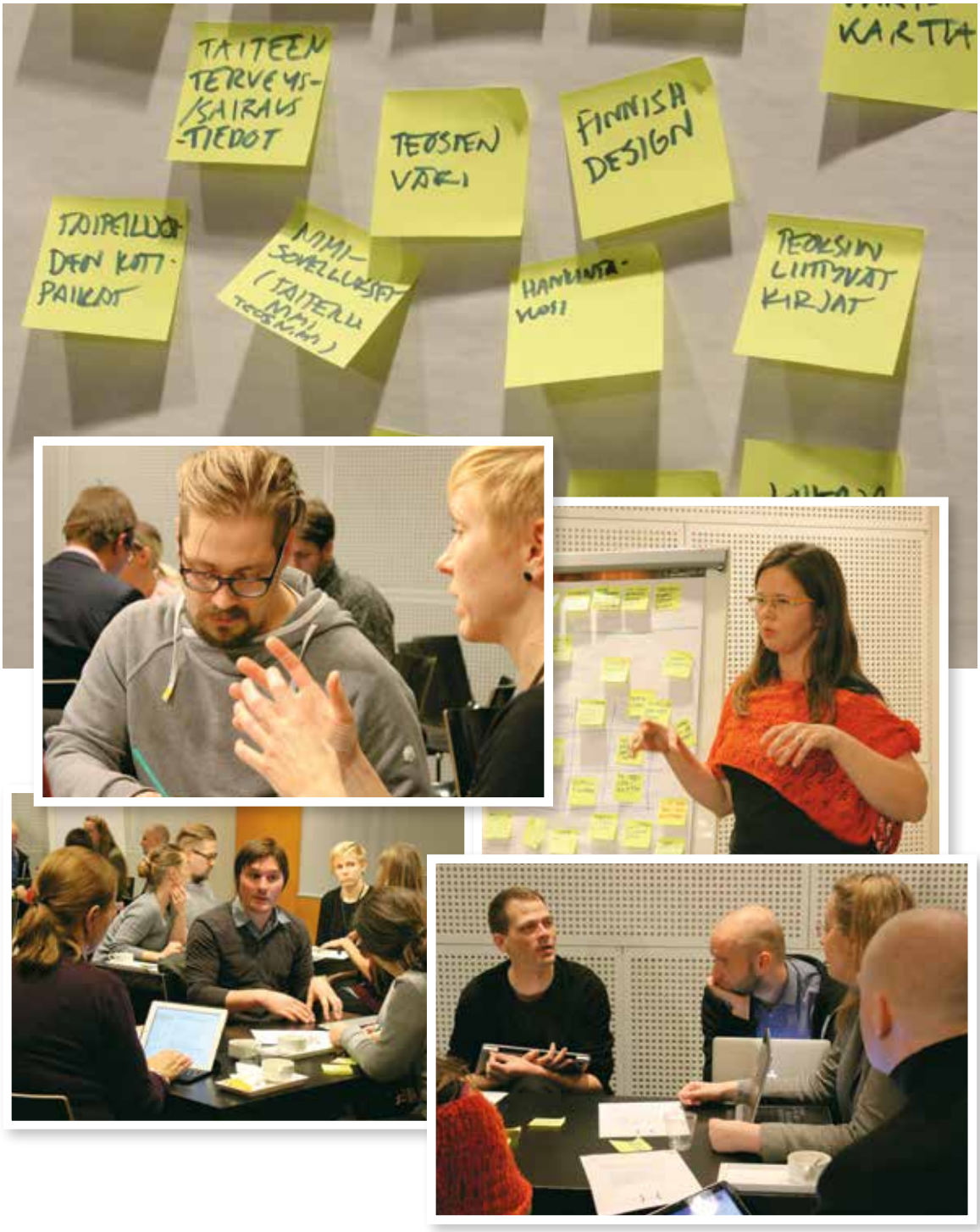
41 Within the AvoinGLAM frame also a third project *Hack4FI - hack your heritage* (2015—2016) was funded by the Ministry of Culture and Education. I was also an initiator and project manager for this project, however I have not included it in the doctoral work.

low summarizes the main co-design activities and empirical materials related to each phase, which I have analyzed in my doctoral research. The accumulation of empirical material in AvoinGLAM was abundant. Even the online platforms for social networking and collaboration produced plentiful of data, and it should be said that I did not analyze all of the materials with the same level of scrutiny. For example when exploring AvoinGLAM's digital spaces for collaboration, I did not analyze the content of the discussions, but chose to rather focus on recurring patterns and themes as that I had become interested in through my own participation on these platforms. However, all major outcomes from the co-design materials (e.g. mapping assignments) were analyzed and converted to a digital form (e.g. summaries). In addition, the team produced partial transcriptions from the sound/video recordings from the workshops and semi-structured interviews, and these materials were afterwards thematically organized through coding data. Perhaps this is self-evident, but after four years of being immersed in the AvoinGLAM initiative as a design researcher and an academic activist, there are many engagements and experiences that I do not describe here but which nevertheless affected the design, process, and my stewardship of the initiative. My AvoinGLAM efforts are elaborated and discussed in detail the research Article 5, here I provide only a brief description of the main efforts in a chronological order (Marttila 2016).

As the first phase of AvoinGLAM, I, together with colleagues and members of the movement, conducted a series of co-design workshops. These workshops were directed to local libraries, archives and museums in 5 different cities in Finland [C2] (see also Salgado and Marttila 2013). The workshop participants would go through five different assignments in groups, – e.g. mapping the "levels of openness and participation" of the organization they represented, or discussing the practical application of "principles of openness". These assignments included diagrams, (framework drawings), and a set of guiding questions and themes, in order to aid participants to discuss the themes related to open digital cultural heritage and opening practices. The aims of the co-design workshops were to collectively map and understand the current state of activities and projects related to open culture in Finland, and to give institutions a platform to bring forward and make visible the internal and external challenges and obstacles they faced in opening their digital holdings for a wider public. In addition to co-design workshops dedicated to official institutions, cross-pollination workshops that brought together cultural heritage and art institutions and cultural data and content were also organized [C4].

Photos AvoinGLAM (CC BY-SA 3.0).

The AvoinGLAM working group organized co-design workshops with cultural heritage institutions to map and understand current challenges and opportunities in opening digitized collections to wider public. The participants went through several assignments in small groups. Pictures are from the first workshop in Helsinki, later similar workshops were organized in different cities throughout Finland.



In order to facilitate cooperation between the art and cultural heritage institutions, and open culture practitioners and appropriators, AvoinGLAM organized workshops a series of so called cross-pollination workshops. The pictures here are from the workshop organized in collaboration with Museum of Contemporary art Kiasma to probe and explore the possibilities of open cultural data.

Table 6. An overview of participatory and co-design activities, design experiments and empirical qualitative data obtained in the AvoinGLAM case.

Activity	Participants and collaborators	Design research artefacts/experiments
[C1] Open Science and Culture Hack Day	50-60 practitioners and appropriators of open cultural data and materials	Open Science and Culture track design for festival and coordinating distributed collaboration Hack day and seminar planning Mailing list
[C2] Local co-design workshops for identifying possibilities and challenges for opening cultural data and content, and organizational practices	Representatives from regional libraries, archives and museums The AvoinGLAM volunteers and activists, project members	Co-design workshop design: structure and design assignments, framework drawings Information lecture and information package about the theme Collective reflection and analysis of produced materials First version of the public AvoinGLAM website and social media channels
[C3] Open cultural data master class, 5 months	22 participants from Finnish cultural institutions. Volunteer and paid experts, tutors and teachers. Members of Open Knowledge Finland association and AvoinGLAM, project members	Master Class thematic lectures and resources Online peer-knowledge repositories in Google+, Google Docs and Facebook Common-pool resources of open cultural heritage by participating institutions Open culture design experiments by participants Booklet guiding for opening cultural contents Online course on peer-to-peer university Short semi-structured interviews Questionnaires
[C4] Joint scenario workshop for open cultural data appropriators and providers.	25–30 participants (open invitation) Members of Open Knowledge Finland association	Scenarios and use-cases

[C5] Hack4Fi – Hack your heritage hackathon 2015	60-70 participants representing both creative appropriators and cultural institutions. Members of Open Knowledge Finland association and AvoinGLAM, project members	Hackathon concept design and facilitation 20 cultural re-use concepts, scenarios and demos developed by participants
[C6] Sustaining and scaling AvoinGLAM	Members of AvoinGLAM working group, and followers of AvoinGLAM Cultural heritage institutions and Open Knowledge Finland association members General public	V2.0 of AvoinGLAM website, visual identity and brand Design for forking and spinoff projects, sharing ownership and access Shared principles for OpenGLAM organization Funding proposals

In the second phase we organized a 5-month *Open Cultural Data Master Class* for Finnish culture and memory institutions, geared towards mastering issues on open culture and data, and towards learning and exploring in practice how to open-up a portion of their collection to a broader public [C3]. More than 20 participants from different institutions throughout Finland took part in the course. The participating organizations released cultural data and/or content, and made it available either under a Creative Commons license or under the Public Domain Mark. This initiative also produced an online course on P2P University and a guidebook about how to open up cultural data and content (see Marttila and Sillanpää 2014). The main focus of the course, however, was to provide a structured setting for sharing principles and knowledge about how a GLAM institution can be more open, a checklist for opening data and for mapping an organization's current and future activities.

The third phase of AvoinGLAM was the establishment of the *Hack4FI - Hack your heritage!* initiative [C5]. The main component of Hack4FI is a yearly cultural hackathon and competition that brings together diverse group of coders, designers, artists and representatives from cultural heritage institutions. The initial reasons for initiating and designing a cultural hackathon were twofold: despite available open cultural content, we lacked good national examples of cases, of the benefits of opening cultural data and content, and of how people could use the new resources; also the interaction between cultural institutions, practitioners and other stakeholders was very limited, and we needed to enhance the conditions for more fruitful collaboration, exchange of ideas, knowledge sharing and networking.

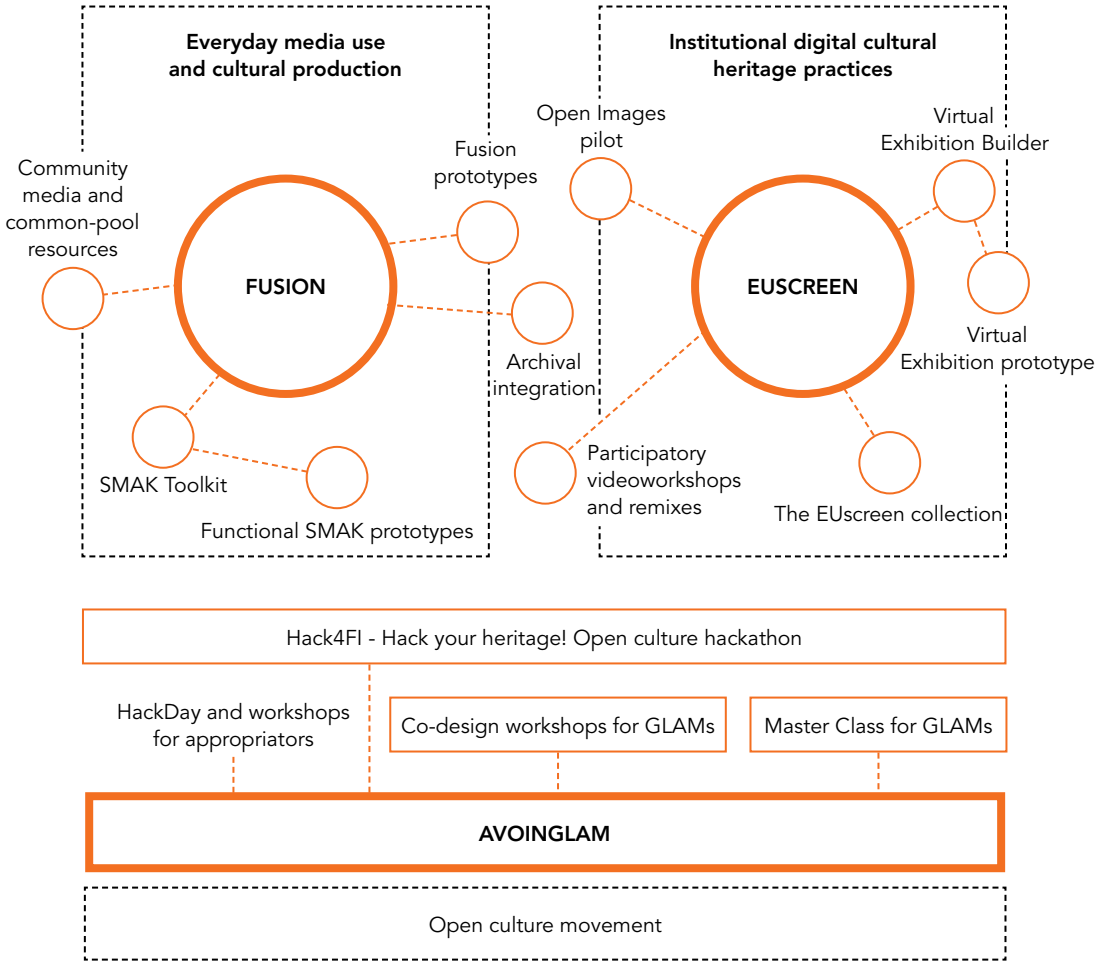
Photos AvoinGLAM (CC BY-SA 3.0).

AvoinGLAM organized a 5-month course, *Open Cultural Data Master Class,* on mastering issues surrounding open culture and content, and learning and exploring in practice, how to open-up a selection of digital holdings using Creative Commons license or under Public Domain mark. Over 20 participants from different GLAM organizations took part in the course.

AvoinGLAM initiated Hack4FI – Hack Your Heritage! cultural hackathon to support and facilitate the creative re-use of open digital cultural heritage data and content, and enhance the collaboration between appropriators and cultural heritage professionals. Over 50 people participated in the first Hack4FI and engaged with Finnish open digital cultural heritage. This diverse groups of coders, designers, artists and cultural heritage professionals produced over 20 concept designs and prototypes.

Currently AvoinGLAM is in a scaling up phase [C6], and we are advocating for a national open-culture policy for cultural heritage institutions in Finland that would give guidelines and recommendations for a licensing framework, accessibility and so forth (Marttila and Sillanpää 2015). In addition, the current aim is to find new homes and hosts for some of the initiatives initiated by AvoinGLAM, enabling them to get a life of their own that is tied into the culture of opening cultural heritage rather than to the AvoinGLAM institutional framework.

Figure 5. Illustration of the three design research cases and selected participatory design experiments, prototypes and socio-technical arrangements.



3.7 Reflecting upon the research design

It is commonly acknowledged that Participatory Design (PD) projects can employ very diverse and entangled processes, from which insights and findings are not easily transferred and replicated outside the context. The diversity in approaches and methods also poses a challenge for articulating the methodological advancements within PD, and making the visible to other fields (Frauenberger et al. 2015). PD processes are inherently situated, which means that activities are embedded into a specific context and activities are carried out from a particular position, by a particular set of participants. This type of situated design research foregrounds "the interactions and interdependencies between designers, design, design methods, and the use situation with its actors, activities, structures, particulars, and broader context (Simonsen et al. 2015, p. 1). In my doctoral project, a specific construction of the field defined the focus of the design research activities, and its relation to the field of the study. As suggested by Simonsen et al. (2015) in situated designerly knowledge production, "analysis and design should be carried out in continuous dialogue with the field and in collaboration with participants" (Simonsen et al. 2012 p. 3). Similarly Bødker and Iversen (2002) call for reflective design in action when designers are engaging "wicked problems". While reflection-in-action has been an underlying part of my design research methodology, in this section I discuss in retrospect some specific issues related to the validity and applicability of the constructed knowledge in this doctoral work, and the limits of the research.

To structure my reflection on the methodological aspects and research design I make use of the evaluation framework introduced by Frauenberger and colleagues. This assessment 'tool' offers four distinctive facets to think through: "epistemology, values, outcomes and stakeholders". (2015, p. 96). First I assess the contribution to knowledge, and the validity of the presented insights and findings, and weather these contributions are transferable to other context. Second, I discuss the values and politics behind the doctoral research, paying special attention to my articulated academic activist stance. Third, I account for the stakeholders in the cases, and discuss what was the nature of their participation. Forth, I review my research journey and strategy of constructing the field. In Chapter 5 I will address the specific knowledge contributions this doctoral research.

The empirical data obtained from the cases is rich and diverse. In my research design I included three cases that differ from another quite significantly, especially AvoinGLAM is a special kind of arrangement compared to the EC co-funded technology development projects Fusion and EUscreen. Despite the differences in the set-up of the three projects vis-à-vis one another, the participatory and co-design activities and experiments used are of the same kind. The cases represent three perspectives on the field, one placing emphasis on the point-of-view of citizens and everyday communities of practice (Fusion), one taking into account the viewpoints of official cultural heritage institutions (EUscreen), and the last focusing on the merged view of the two, including other stakeholders (AvoinGLAM). The unit of an analysis has not been the cases per se, or the projects as a whole, but the co-design instances and participatory experiments. The research strategy's focus on co-design activities and participatory experiments was chosen in order to facilitate the alignment and comparative assessment of the data, as it allowed a better comparison of the various empirical materials than what would have been possible by comparing other aspects of three very different cultural heritage projects. The empirical data, though, has its shortcomings: the cases are Europe-centric, and research activities are carried out together with rather homogenous groups of people (e.g. most participants – but not all - had graduated from university, and worked in a cultural or academic context). Therefore the knowledge contribution is geographically and perhaps socially biased; other contexts with other participants might lead to other dynamics and findings. In Chapter 5, I discuss the key contributions of this doctoral research, how they relate to the PD tradition, and their applicability in other domains than digital cultural heritage.

The doctoral research and its design activities were influenced by my political commitment to open and equal access to designating, using and accessing digital cultural heritage, and by the methodological framing within Participatory Design. From the very first PD projects, the tradition has been concerned with values such as "democracy, empowerment and empathy" that inherently affect future projects (Frauenberger et al. 2015). In my doctoral research, the notion of an activist academic was articulated a posteriori to the cases, however, my open culture activist stance and drive to pursue openness became more and more explicit during the doctoral work. Being able to bring forward my political perspective in AvoinGLAM made me feel that I became more invested, accountable, and socially and morally engaged – also as a researcher – than was the case in a traditional

project framing. Undeniablly, my articulated positioning and advocacy in the AvoinGLAM case has influenced who participated (both through influencing who I connected with and through influencing who chose to participate), and what kind of activities were carried out. Good intentions might become a source of disruption and conflict. For example some of my personal values that were imposed on the AvoinGLAM projects (e.g. same salary principle) were a source of a conflict within the projects (see Article 5: Marttila 2016). As I have discussed in research articles 3 & 6, the values of the citizen participants in the co-design efforts often differed from those imposed by the project, and this created dilemmas and resistance towards the use of the developed digital tools. Also, institutional values sometimes overrode what individuals considered important or desirable (Marttila and Hyyppä 2014a, Marttila and Botero 2017). The unfolding and articulation of values in the cases were carried out in multiple ways, in co-design workshops, interviews, questionnaires, and though creative making.

My research aimed to move design practice towards design for openness and commons design, where multiplicity and dialogue is more important than smooth project execution. Therefore, I consider that the social dilemmas encountered in part help highlight and make clear what is at stake in communal efforts to negotiate the terms of participation. In the beginning of the doctoral work (i.e. in Fusion) my position was not yet articulated or directly communicated to the participants, and progressively it became more spelled-out in the later phases of my project (in EUscreen, and especially in AvoinGLAM), as I gained confidence in my project and knowledge of the field. Evidently this move influenced the cases, and perhaps in this regard the empirical materials are not comparable as uniform expressions, but rather as situated or motivated ones.

In Chapter 2 I unfolded the trajectory of how participatory design has been moving closer to open-ended commons design. One aspect in that analysis was to consider 'who collaborates'. In Fusion the participants were chosen and invited through careful selection process to take part in pre-defined process. Similarly in EUscreen some co-design processes were carried out rigorously as planned in the beginning of the project, however more flexibility was introduced to engage different groups and communities to more open-ended explorations. In contrast, in AvoinGLAM participation was open for all by default (some events had limited number of participants). Participation thus went from pre-selected to self-selected at the same time as my involvement went from observing co-designer to more

overtly political collaborator. As briefly summarized above, the stakeholders participated in the co-design activities in the cases in under different terms. Yet, looking at the cases together, the variety of different stakeholder perspectives was high, which might increase the weight of findings presented in the dissertation.

My journey through the three cases has involved a constant construction of the field, as discussed earlier in the chapter, and a process of weaving together of multiple contexts, actors and activities. Even if, accordingly to my research design, the detailed research questions and objectives have evolved throughout the doctoral research, what has remained the same throughout all cases is the pursuit of ways of opening up cultural heritage collections and bridging institutional practice, everyday practices, and technology systems related to digital cultural materials; as well as the effort and aim to understand what this opening up and commoning entails.

The design research approach I adopted in the different cases differed from one another in multiple ways. I bring forward three aspects that are especially salient:

First, the nature of collaboration and participation in the cases. Fusion and EUscreen represented a more traditional (and conservative) research approach that treated stakeholders more as informants and respondents that could influence and inspire design but were separate from the design process. This is the case even if in Fusion we considered community members to be 'owners' of their media practices (see Article 1: Marttila et al. 2011). Similarly, in EUscreen, representatives of the organizations were welcomed to the co-design process as experts of their work practices, and practitioners (e.g. remix video editors, programmers, artists) as specialists of their own domain (see Marttila and Hyyppä 2014a/2014b). In AvoinGLAM, even if participating people had different roles and capabilities, it appeared to me that we were all working together towards shared goals — each with our individual resources, reasons and motivations — and this influenced e.g. what design methods and approaches were applied and how they unfolded. The last project thus reflected the attitudes of the participating people more genuinely. For me this also meant a major shift from participant observation and 'just' facilitating participation to infrastructuring for commoning and commons.

Second, the knowledge perspective of an academic activist. When operating within AvoinGLAM there was no-need to keep my personal (political) agenda hidden, and maintain an illusion — for myself or the other participants — of objectivity or non-interference in the matters at play, on the contrary political engagement was the driver of the project for me as well as for others. The more I

had been engaged in creating access to digital cultural heritage, the more I came to have a stronger stance on the issue. Open culture advocacy and policy work became an integral part of my design research activities. In addition to communicating research results to peers and make use of these in an academic context, I shared ongoing and intermediate findings and insights through other forms than scholarly outputs (e.g. booklets, reports, blog posts).

Third, the institutional framing was different between cases, and this affected the conditions under which the knowledge was produced. The first two cases were co-funded by the European Commission (EC) and heavily influenced by the policies and requirements set by the co-funder. The EC's agenda to create "memory institutions" through integration of content sourced from national cultural heritage institutions framed the projects and directed the research efforts, as well as the design and development of the technology. In addition, the project plans were part of the signed contract between the parties, meaning among other things that in practice it was difficult to make changes to the agreed-upon plans during the project — even if the research findings would strongly suggest to take a new direction or participants would voice their desire for new directions. In fact, this would be going against the action research process on the project level. In addition, multiple and sometimes conflicting agendas influenced the design decisions made in the projects. Personal contemplation, and shifting between different personal interests (research, design and activism), along with repositioning myself according to different motivational and ethical positions, affected my mode of inquiry. This included how I conducted fieldwork (e.g. in addition to institutional cultural heritage my multi-sited approach included sites of community-created heritage), how I engaged with participants, and how I conducted the design experiments (e.g. to support video remix practices that overlooked the current copyright regime). This said, these shifting of positions, and reflection and revisiting the research problem and questions after every case, does not mean that the design research activities would not have been carried out and documented rigorously. This 'drifting' in Research Through Design approach (RtD) can be considered as a quality measure, as it indicates that the design researcher/designer is "capable of continuous learning from findings and of adjusting causes of action" (Krogh et al. 2015, p. 1). Even if the whole journey and its passages and trails were not known in the beginning of the research project, it is good to bear in mind that all of the cases, and thus all of the participatory and co-design activities that are under analysis in this doctoral dis-

sertation, stem from structured projects with defined milestones, deliverables and limitations in time and resources.

In the next chapter we will look closer to the individual research articles and the insights and contributions they put forward.

Finnish Museum of Photography / Helge Heinonen

4. Summary of the research articles

This chapter summarizes the original research articles of my doctoral work. The dissertation consists of six peer-reviewed and published research articles. Four of them discuss and analyze the design research cases that form the empirical foundation of my study: the two EC co-funded information infrastructure projects for digital culture and cultural heritage – Fusion and EUscreen – and the Finnish open culture movement advocating for and supporting opening-up digital cultural heritage collections for wider use – the AvoinGLAM initiative.

To illustrate the theoretical foundations and framework of the thesis, and to better root the design research cases in the relevant research literature, I have included two articles in this doctoral dissertation that explore and review the literature in relevant fields to my study. Below I discuss the articles thematically and through their purpose in the doctoral dissertation. I will start by introducing the articles that discuss the cases, and after that the articles addressing the relevant literature for my study. The articles are included as Appendix 1.

Each of the research articles served a specific function in the doctoral work in my attempt to address my overarching research question: *How can we collaboratively design socio-material-technical information infrastructures for digital cultural heritage in more open and symmetrical terms?*

Below I categorize the articles and their purposes under four headings:

(1) Presenting the three co-design cases and understanding emerging media and social practices linked to digital culture and digital cultural heritage (Articles 1, 3 & 6).

(2) Documenting and discussing design strategies and solutions for digital culture and digital cultural heritage (Articles 3 & 6).

(3) Exploring and reviewing research literature on co-design of digital media and technology, and on commons, to base the development of theoretical foundations (Articles 4 & 5).

(4) Developing a framework for infrastructuring for cultural commons (Articles 5 & 6).

4.1 Collaborative design of a software toolkit

The article *Co-Design of a Software Toolkit for Media Practices: P2P-Fusion Case Study* introduces the first case study of the thesis, Fusion. This technology platform aimed at providing a decentralized software system and digital tools for ordinary people to publish and share community-created media. The analysis centers on the co-design process, the activities undertaken in relation to community media practices and the designing of an open source software toolkit and community media applications.

The article explores various aspects of participant engagement and empowerment in the co-design process, and asks: What benefits and challenges are there in empowering and engaging everyday people in the co-design of a software toolkit? What kinds of strategies, methods and work practices are required to facilitate and feed this kind of co-design process? The research paper is directed to professional designers that are interested in engaging with communities of practice for the design of IT/ICT, and especially software toolkit components. Through empirical analysis of the case, we – I and my co-authors Kati Hyyppä and Kari-Hans Kommonen – present lessons learnt in the process and offer suggestions for future work. Our findings point to the need for Participatory Design (PD) practitioners to move toward more open-ended and fluid processes.

The article brings forward key findings from a 'conventional' co-design process, in which the co-design activities were planned, structured and led by designers and design researchers. The role that the project envisioned for the participants was

twofold: first, to inspire and inform the design of the software toolkit and, second, to use the toolkit to develop community applications linked to the developed peer-to-peer technology system. In the paper we reflect on the co-design process, and propose that long research and development projects could be more flexible with regards to the changing conditions of co-design participants and aim to adjust according to their changing needs and resources. If the process is fixed, it is difficult for a participant to influence or propose changes, which could lead to frustration and participants abandoning the whole process. Therefore, it is essential to create and nurture an open and trusting environment from the start, and maintain continuous communication practices throughout the project – also between the programmed co-design events. In the article we also note that the lack of a common design philosophy and vision, both among project partners and co-design participants, blurred the objectives of the design and its process, and perhaps decreased the motivation of the partners and participants. In retrospect, it is not difficult to pinpoint why this lack of motivation occurred, as the PD approach and design vision was determined in the project planning phase, shared only by some of the project partners, and in practice not open for co-design participants to influence.

The case incorporated several co-design methods, tools and work practices. The use of low-fidelity design tools and paper prototypes in the ideation phase supported not only identifying the needs and wishes of communities, but also contributed to the forming of a common language among the design partners. The co-design tools developed in the project (e.g. a design game) enabled the communities to describe their media practices and interests without needing to know the technology terminology or details. The use of hands-on exercises also concretized the design ideas for professional designers and developers. Yet, one of the key insights of the co-design process was that the professional designers should provide access to resources and tools, such as design documentation and early prototypes, to encourage and enable communities to share their experiences, knowledge or designs *within* the community and among their peers in a wider social circle (e.g. to other similar communities online). Often only the end-results (e.g. scenarios, concepts) are shared within the community that the co-design partners represent, and documentation of hidden and tacit knowledge probed in the co-design sessions was not distributed. Learning from the experience, we suggest that professional designers should provide access to the resources and put more effort into contextualization and guidance for supporting various levels of appropriation and creative re-use.

In addition to studying and understanding communities' media practices, we argue, it is important for designers to support self-discovery and unfolding of evolving media practices. It is beneficial for the participants and for the technology design if participants have a genuine and a real-life need or a practice that they can contribute to the process, and naturally in return obtain meaningful knowledge or experiences that, in turn, contribute to their everyday practices. However, this does not mean to imply that all the participants should be experts or knowledgeable in software programming or technology, but that media practices and community knowledge can provide valuable insights for design. In the Fusion case, the co-design process was aimed at not only aiding the design of the software toolkit, but also aiding the self-discovery and evolution of the participating communities' media practices. Through these engagements, I came to realize the significance of rehearsing and reflecting these emerging and evolving practices in a secure environment without possible ramifications of the communities 'illegal' media practices (e.g. sharing or remixing audiovisual copyrighted content without permission).

In our findings we conclude that in spite of the challenges involved in engaging everyday people without programming skills in the co-design of technology infrastructures, it is important for designers and software developers to learn to design for openness – both in process and in design materials – and for designability. This is because in the rapidly evolving global and open digital infrastructures only collaborative and designable systems will be able to respond to the changing demands of the people and their everyday media practices.

The article and its findings directed the future trajectory of my doctoral work, both in developing methods for doing co-design in commons frameworks, and in providing insights about commons-based cultural production and everyday media practices. Even if the terminology or theory of commons was not visible in this article, the importance and need for creating common-pool resources of both 'design commons' and 'cultural commons' were present, and the need to let non-designers influence the design process clearly emerged. Similarly, the notion of infrastructuring was absent, although the strategies to probe, and support and stimulate communities' media practices was already discussed in this early article. The concept of commoning was also not applied, although I recognized and discussed the participants peer processes, including maintenance of and caring about common resources.

4.2 How copyrights complicate media design

The second article is addressing the second case of my doctoral work, EUscreen, and draws attention to copyrights as a neglected aspect in media design and infrastructural development, even if copyright issues are pivotal to the ability of cultural and heritage institutions to show their collections. The *Rights to Remember? How Copyrights Complicate Media Design* article argues that copyright issues are an overlooked factor in the design of digital participation platforms for audiovisual cultural heritage. This argument is developed by analyzing the co-design process of the EUscreen portal beta version and various design initiatives and experiments linked to the endeavor. In the article we - my co-author Kati Hyyppä and I – detail how copyrights of digital cultural heritage placed tight constraints on both the selection of the digital audiovisual heritage collection content available to EUscreen, on the use of this content, and on the platform design itself, overruling the envisioned Participatory Design (PD) approaches in the project.

In the paper we present findings from a survey that aimed to study and clarify the copyrights of the media content that forms the EUscreen audiovisual collection, and what these rights permit in terms of use and design of the portal. Seventeen European audiovisual archives and public broadcasters replied to the online survey providing insight to the content selection and rights clearance processes in each institution, and clarifications on the scope of rights they had over content. In the core of the survey were short scenarios that explicated and narrated possible use and creative re-use of the audiovisual content on the platform. The survey showed that intellectual property (IP) issues clearly influenced the content selection for the portal. Due to the IP regulations and challenges in clearing content copyrights, large part of the audiovisual collection of the portal included segments from news and current affair programs, because these materials were among the few materials that institutions held all the copyrights to. Hence, the collection of European audiovisual television heritage became narrow in scope and representation of European themes and culture. All rights were reserved when content was to enter in the EUscreen collection, resulting in a scenario where re-use or appropriation of the materials would not be allowed even if it was one of the core goals and design ideas behind the platform. In addition, a number of general design

challenges could be identified on the basis of these findings (e.g. download of the platform content would not be possible).

The design of the portal was thus significantly limited compared to the original aims and the design team had to develop new design strategies and experiments to meet the objectives of the project and allow people to access and take part in the creation of their shared history and culture. Three main design strategies were planned to overcome - or at least create workarounds around - the obstacles created by copyright restrictions. These design activities included pilots and experiments (e.g. a video remix workshop, a prototype for a virtual exhibition tool) as well as a separate open collection derived from the main EUscreen collection. The design activities were carried out in order to demonstrate the value of emerging media practices and creative re-use of archival audiovisual media. They also aimed at engaging possible future users in shaping and framing the portal. These experiments functioned on two levels, providing designers and developers of the infrastructure insights with visions of alternatives and possible futures that were not possible at the time due the copyright restrictions. For individuals and institutions they offered a possibility to rehearse current and emerging practices and pilot novel services in a controlled and legally safe environment.

To bring the discussion onto a general level, we reflected on what enclosure through copyright would mean for our understanding of, and access to, digital cultural heritage. While the emphasis driving the majority of projects that digitize cultural objects is to make cultural heritage more accessible and re-usable by wider public, the outcomes can also have an opposite effect. The aim of the EUscreen portal was to facilitate a multiplicity of Pan-European voices and memories on various topics (e.g. arts and culture, conflicts), and enabling citizens to access, reuse and reshape memories of Europe and constitute its cultural heritage. However, copyrights emerged as the major selection parameter for what was included on the EUscreen platform, even if the pre-identified user needs, and general objective in EC to provide wider access to cultural heritage could have been more desirable guiding factor for the selection. If digital cultural heritage collections function as a collective memory – as intended – and copyrights determine what allows users to access, then copyrights end up determining what kind of culture and history citizens and societies have the *right* to remember. In the article we therefore pose the question of, if copyrights guide the selection and use of digital cultural heritage, does common memories then become distorted and legalistic rather than

citizen-driven and historical? This is the case when the creation of a digital collection is not based on what would be relevant, but is based on what the existing right schema allows to be shared. In addition, there is a risk that digital tools and systems are developed for prevalent authorities and existing frameworks. If copyrights guide what can be remembered, does this then create a society of amnesia or dementia rather than polyphony of voices in which different memories shape our common culture and history?

The observation that copyrights strongly affects content selection and the type of content is made available online for the public is important also regarding future activities and initiatives planned around archival audiovisual content. Importantly, we also note how infrastructural initiatives dealing with cultural heritage risks re-introducing copyrights to materials where copyrights have already expired, and which are thus are under public domain. Tools and open license frameworks such as Creative Commons (CC) offer rights holders a more flexible way to permit certain rights to their holdings, however some cultural institution have "misused" the license to mark no-known-copyright or public domain archival content under CC license. Even if in the context of EUscreen no re-licensing was introduced – to our knowledge at the time of writing the article – the phenomenon was relatively common, and represents one way in which commercial copyrights logics work against constructing open cultural commons. Together, these findings challenge and frustrate the promises of participation, collaboration and creative re-use that underlie both practical and scholarly discourse. In conclusion, the article calls for design and Human Computer Interaction (HCI) researchers to remember and pay more careful and sustained attention to copyrights and other legal frameworks when they determine what can be collectively remembered – and how – on information infrastructures for digital cultural heritage.

This article helped me to pinpoint and articulate some of the challenges that current copyright regime imposes to the design of tools and system for digital cultural heritage, and to practices connected to them. This article also brings ad-hoc and temporary design arrangements and workarounds as design strategies to my doctoral research discourse. I apply similar framing in the future articles about the three design cases. I connect my research to wider societal issues for the first time, and more importantly link the work to the concept of commons.

4.3 Co-creating a commons culture

The *From Rules in Use to Culture in Use – Commoning and Infrastructuring Practices in an Open Cultural Movement* article introduces the third case of this doctoral dissertation. Building upon on long-term engagement with the open cultural movement AvoinGLAM this article documents the initiative and its key design moves. The earlier experiences in engaging in the design of two technology platforms for digital cultural heritage Fusion and EUscreen, led me to initiate the movement as an alternative strategy – constructing cultural commons – to these project-framed initiatives for technology development. However participatory and user-centred these two projects aimed to be, they did not succeed in pooling and opening digital heritage, or in enabling genuine participation between individuals and institutions.

I analyze the movement and my engagement through key efforts in linear continuum over four consecutive years: foundation building, creating shared knowledge base and resources, framing conditions for creative re-use, and fostering and sustaining commons. In addition to descriptive account and analysis of the taking part in forming and 'designing' of the movement, the article puts forward a proposal that in the professional practice of Participatory Design (PD), rather than focusing on facilitating and designing for participation, we should pay more attention to developing and sustaining a commons culture. Thus, the paper explores how design and commoning practices can contribute to sustaining open cultural commons and safeguarding against enclosure of our common culture, and examines how PD could strengthen interaction and participation in commons frameworks.

By critically reflecting on the maturing of a local Finnish chapter of the OpenGLAM (Galleries, Libraries, Archives and Museums) movement, the paper contributes to the ongoing discussion of design as infrastructuring in complex and open-ended socio-technical settings. The empirical material is based on long-term engagement (four years), action research (e.g., interviews with key actors/organizations, designing and organizing workshops, hackathons and other activities of the network) and personal reflections on these experiences. In analyzing the materials, I probe what kind of design practices and commoning activities contribute to the co-designing, building and sustaining of open cultural commons. Results of this collective infrastructuring and commoning within AvoinGLAM included: a) A set of common-pool knowledge resources created and pooled by the movement, such as

open digital cultural heritage collections, and learning materials. b) New formats for collaborative design and creation and peer learning were introduced (hackathon, master class etc.). These activities aimed for capacity building, strengthening the community, and bringing together and bridging different groups from the cultural field. c) Structural changes and new mechanisms were established for the movement's projects (e.g. to balance between paid work and volunteer work). d) Policy and advocacy work conducted in a form of reports, surveys and recommendations.

The work presented in the article builds on traditions that consider design as an open and collective process of designing practices together. In particular, the article draws on contemporary thinking and conceptualizations on the concept of commons – to better understand new modes of participation, production and designing. In earlier research the relationship between commons and design has been used to investigate collaborative creation and opening production (Elzenbaumer 2015; Björgvinsson, 2014; Seravalli, 2014). Commons has also been considerer to be a useful device for informing new discourses of participation in contemporary settings (Marttila, et al. 2014; Teli, 2015). The work is also linked to insights from community-based Participatory Design (aka Community PD) research that has identified a need for understanding the implications of new forms of politics and practices that see design as concerned with infrastructuring (Ehn 2008, Björgvinsson et al. 2010, 2012a, Hillgren et al. 2011, DiSalvo et al. 2012, Le Dantec and DiSalvo 2013). This paper thus contributes to the discussion on commoning and infrastructuring in PD by bringing findings and insights from the experiences of an open culture movement. The paper discusses the co-designed infrastructuring and commoning activities, and indicates how issues revolving ownership and the use of common recourses are not only impacted by rules and regulations, but also by cultures surrounding the infrastructures. The article probes the strategies of ongoing and open-ended infrastructuring efforts, and how they aim to support and nurture cultural commoning activities, as well as the process of becoming of the open cultural commons in Finland.

In the current cultural environment, commoning activities and cultural practices increasingly rely on technology platforms and social networking sites governed by often commercially motivated terms of use and regulatory frameworks that their participants have not been able to negotiate or influence themselves. This results in that platforms are not always well matched to local needs and conditions, and they appear to be aimed at sustaining commercial goals of their providers rather

than sustaining viable commons of their participants. Based on my analysis of the AvoinGLAM case and my involvement in it, I propose that in co-designing and commoning for open cultural commons, we should work through infrastructuring a "commons culture" rather than mainly through designing technology and legal and regulatory infrastructures (e.g. licensing frameworks, web portal). The paper also suggests that building on commoning principles, vocabularies and ideals that actors (institutions and individuals) can use to define their identities can be complementary to setting rules that external authorities would respect. Furthermore, the paper argues that an infrastructuring approach that works towards open cultural commons can thus not only build upon the traditional commoning principles of rules-in-use but should be extended to encompass culture-in-use.

Articulating my intertwined role and experiences as a designer and an open culture activist, and the ongoing everyday engagement with the movement, helped me to better frame and develop the commoning and infrastructuring strategies, and deepen my understanding of the characteristics and logics of e.g. governing and caring for cultural commons.

4.4 Co-designing and collective infrastructuring of two information Infrastructures for digital cultural heritage

In the *Infrastructuring for Cultural Commons* article me and my co-author Andrea Botero reflect on our involvement in the design and development of two information systems: Fusion and EUscreen. Both of the cases are infrastructural initiatives aimed at contributing, from different angles, to wider public access to and appropriation of the European digital cultural heritage and digital culture in general. We situate our co-design activities and infrastructuring strategies in relation to a broader interest in advocating not only the preservation of and access to digital cultural heritage, but, more importantly, enabling collaboration, to support the emerging practices of diverse user groups, and to contribute to cultural commons. In this article I develop my theoretical framework for my doctoral dissertation.

To frame and analyze the two cases we build on the concept of commons, understood as particular arrangements for managing and governing shared resources (Ostrom and Hess 2007; Benkler 2013; Bollier and Helfrich 2012). The focus is

particularly on characteristics of the concept that has recently been referred to as cultural commons (Madison et al. 2010; Hyde 2010; Hess 2012; Bertacchini 2012). To address these cases we combine this broader framing of commons with a discussion of the concepts of infrastructure and infrastructuring, as being pivotal to the contemporary discussions of design and especially in Participatory Design (PD) (Star and Bowker 2002; Karasti 2014). To enrich the analytical framework we found the treatment of the Fusion and EUscreen cases on the notions of installed base and gateway in information infrastructure development. Through these notions we explore possible strategies for collective infrastructuring, and interrogate how infrastructures and their conditions can be instrumental in constructing and contributing to cultural commons. By presenting insights and findings from the collaborative design efforts made for the infrastructures in question, the paper thus addresses the complexity and limits of infrastructuring for cultural commons.

We find that these notions, installed base and gateways, were useful in discussing the socio-technical infrastructural development required for digital audiovisual cultural heritage, and for identifying infrastructuring strategies that could contribute to cultural commons. We believe that engagement with the conception of installed base is a useful move for identifying and reviewing in depth what are the components of existing infrastructures and their characteristics, and how they are brought into being and put to use. Probing an installed base can also reveal what conflicts and contradictions can be inherited in it, and in turn, contribute to the design contexts at hand. Active probing and understanding of an infrastructure's installed base can be a useful device for the design and development process, and can be helpful for pinpointing infrastructural challenges such as incompatible socio-technical infrastructures and practices. In turn, the concept gateway as a metaphor can be applied as a practical infrastructuring strategy that helps to plan and direct the design workarounds, interventions and pilots necessary to address and bridge incompatible parts, and to stimulate and simulate new desirable futures and configurations in the cultural environment.

Learning from our cases we argue that initiatives that aim to support the revitalization of cultural heritage through digitization should focus more on the collaborative dimensions that their platforms and infrastructures are aimed at. Our experiences point to the importance of building bridges between different actors and resources, as well as weaving together different contexts and practices as po-

tential infrastructuring activities that could be beneficial to all involved stakeholders. These infrastructuring activities included socio-material-technical experiments such as prototypes and demos for new tools for novel cultural heritage creative activities, archival integration to combine everyday digital culture and institutionalized cultural heritage, matchmaking and co-creation and design sessions with practitioners and representatives from cultural institutions.

In addition, building on our cases we argue that creating socio-technical workarounds, ad-hoc arrangements and prototypes in order to simulate and stimulate the current and emerging practices is valuable for infrastructural development. These explorations have a specific role in enhancing technologies and practices, and further, in these staged instances, stakeholders have a possibility to collaboratively create common ground and build common-pool resources. We conclude, that if adequate, flexible gateways can be proposed during the infrastructural development time, there is a possibility that cultural commons can arise.

In this article I developed the theoretical framework for my doctoral dissertation, which combines information infrastructures and commons and more specifically the notion of infrastructuring and cultural commons. Design as infrastructuring is linked to more its origin and connected to the concept of commons, in addition a notion of cultural commons is addressed. In the article, I identify, name and aim to describe some infrastructuring strategies for cultural commons.

4.5 Situating co-design

In the *The 'Openness Turn' in Co-design. From Usability, Sociability and Designability Towards Openness* article I and my co-author Andrea Botero build a framework for understanding the shifts in focus over time in co-design of media design and digital technologies. Building upon both design research theory and practice, the article paper explores the evolving field of co-design, and aims to interrogate some of the antecedent and contemporary understandings of the field found in the literature. We argue that these different understandings are mediated by a series of 'turns' we identify as: usability, sociability and designability. Moreover, we aim to illustrate how a fourth turn – openness – is entering the stage. The paper thus inquires and situates who is the "CO" in co-design,

and what are the commonalities and differences of these turns. To conclude, we introduce the concept of commons as a way of reflecting on the possibilities of participants in co-design endeavours to influence and negotiate issues like modes of governance and ownership.

Our main course of action has been to look into representative literature in areas that are shaping the discourse in co-design research and identifying the themes, interests, motivations and focus of each of them. Through the selected literature we ask: Who collaborates? What is the relationship between collaborators? Through what means and tools can collaboration be enacted and performed? What are the possible outcomes of co-design? And finally, what does this mean for participants in co-design endeavors and their possibilities for influencing and negotiating issues like modes of governance and ownership. It should be mentioned, that even if these findings are rooted in the research literature, the implications to this framing had originated from the practical design work in Fusion and EUscreen.

In this article we propose a framework for understanding co-design and its unfolding as a series of turns, and identify similarities and differences between approaches as they relate to these turns. In doing this we are drawing attention to the increasing importance and need of open modalities of collaboration in contemporary culture, and argue that understanding the differences and similarities it has with previous turns is key in developing sustained collaborative and open design processes that will keep co-design relevant in the future. Even if various attempts at classifying the evolution of co-design have been made, our proposal offered an alternative frame for reflection and comparison. We use the term evolution in a permissive way – combining it with turns to stress that each turn builds upon the previous ones, re-orienting the field without replacing completely what is already there. Combining evolution and turns has the advantage of implying a historicity of the field – that we find lacking in those frameworks that simply map different design research approaches – while avoiding the determinism of paradigm shifts.

We traced this evolution through four turns in co-design practice and research. In summary, first, the usability turn brought people in as users of designed artefacts. Secondly, the sociability turn expanded the space of design stakeholders to be seen as partners. Thirdly, the designability acknowledged non-professionals as designers. Finally, the openness turn locates design in open peer-driven process taking place in a commons that can be nurtured and infrastructured by designers and other collaborators.

In our attempt to understand the "Openness Turn" in co-design, we identified two main strands of open design literature: A predominant one, at the time, focusing on design artefacts where the emphasis is put on the openness of publicly available designs (e.g. blue prints as documents). The other strand focused more on processual and temporal aspects and open-endedness of design activity and practice (see Abel et al. 2011). This second notion of openness is indicated in co-design research calling for engagement as *infrastructuring* (Björgvinsson et al. 2010/2012) and Community-based Participatory Design (DiSalvo et al 2012) although without addressing openness straight on. Here I first time connected the term infrastructuring to my own co-design practice, and only later grounded the practices to STS and infrastructure studies.

The article provided two key guiding issues for my study and further work. First, it reminded how attributes such as democracy and freedom that share connotations with openness, have been inspiring movements relevant to co-design (e.g. Participatory Design) and have similarities with the notion of commons. Secondly, besides traditional methods and roles offered in a co-design process, designers are increasingly considering and proposing novel situated and collaborative expansions of design spaces for people. And in turn, people are increasingly moving closer to arenas earlier preoccupied by professionals and domain experts. However, at the time of writing this article, these emerging practices were not yet well documented by scholars, and there was little discussion of potentials and limitation. Today still, a lack of comprehensive understanding of what co-design could mean in commons-like frameworks remains.

Above all said, the article helped me to identify and locate existing and emerging co-design practice and discourse, and allowed me to situate my own practice within Fusion and EUscreen to identify gaps in respect to the practice and research from different positions in the cultural environment. In addition, I obtained the required vocabulary to further develop the proposal for infrastructuring strategies and commons design.

4.6 Commons Design, infrastructuring and commoning in PD

In the *Towards Commons Design in Participatory Design* article we probe what the Participatory Design (PD) field can gain from exploring the literature on commons. This second literature review article of my thesis gave me the contextual understanding of contemporary PD, and connected the notion of commons to my case studies, which I found useful in guiding my design work.

Through selected examples I and my co-authors Andrea Botero and Joanna Saad-Sulonen point to some connections and commonalities between commons literature and the PD field. We also bring forward some contributions that this literature can make to PD in order to develop design strategies and approaches towards commons design. We believe these can further PD practices and research when the field is increasingly situating itself from the workplace to more broader community contexts and publics, in addition to aiding PD to operate with and thrive within increasingly more complex design issues and contexts.

We aim to contribute to the ongoing discussion related to emerging new contexts for research and application of PD by providing insights into how research on collective action relying on commons could be relevant for the PD community. From the commons literature we identify three different approaches to commons: traditional commons, new commons and the activist/practitioner movement. From each of these strands we highlight some of the key findings relevant to Participatory Design. Furthermore, we ask: What could we as professional designers and researchers who operate in commons-like frameworks and who aim to support collective action learn from the commons research? How can we link these ongoing discussions to the PD practices and research?

One key finding of commons research we located is that 'an extremely rich variety of specific rules were used in systems sustainable over a long period of time' where the rules are well matched to local needs and conditions (Hess and Ostrom 2007, 7). These factors are also becoming crucial for PD as new technological possibilities increase the possibilities and prospects for people to 1) collaborate, create and share common resources and 2) take part in design activities earlier monopolised by professional designers and other established actors. We also suggest that in PD we might need to look at, understand and engage collectively in processes that are distributed more radically in space and time and

within more complex socio-material assemblies than what has been done previously.

Our brief overview shows that the commons discourse has many connections with PD. The first one refers to a shared democratic political agenda. PD's interest in democratization (Ehn and Kyng 1987; Greenbaum and Kyng 1991) is also fundamental to commons-related studies. By linking PD endeavors to commons frameworks, we could link our efforts to knowledge production, sustainability and resilience on a broader scale than just technology development.

Both PD and commons literatures build upon stakeholders and communities' capabilities and right to act and decide upon their future. In addition, both discuss the potentials and dilemmas of collective action – although using different vocabulary – and its infrastructuring needs. Insights from commons research can offer much more elaborate notions about why, how and under what conditions people do things together, and not only how we seek to or are invited to 'participate'. Furthermore, scholars writing on commons have already tackled some of the issues that are now also becoming relevant for PD, such as questions related to intellectual property (IP) and matters related to distributed and shared ownership. We conclude the paper by suggesting that the PD community should turn more seriously to the implications coming from the contemporary commons literature to ensure the relevance of PD in the future.

This article introduces the term of 'commons design', but does not yet elaborate or make an attempt to define it.

5. Infrastructuring for cultural commons

This chapter combines the theoretical framework of the dissertation – its notions of commons and infrastructure, as well as its survey of the contemporary development of infrastructuring thinking – with the three empirical design research cases. The framework is applied to address the tensions and dynamics of infrastructural development and infrastructural change for digital cultural heritage, and to identify strategies that could contribute to cultural commons. The chapter presents the key contributions of this doctoral research as a set of infrastructuring strategies for cultural commons that can inform Participatory Design efforts across fields, as well as inspire designers and professionals operating in commons settings. The strategies are aimed at contributing to the longevity, sustainability and robustness of commons and collective action. The discussion on commons design, as a design orientation and attitude, and its initial principles concludes the chapter.

5.1 Infrastructuring strategies

In my doctoral research, I propose that we could consider our common digital cultural heritage, especially the collections that are in the public domain, as public goods that could be socially arranged and governed as commons. Here commons are considered as an on-going process and a set of social practices connected to common and shared resources. The phrase 'socially arranged' denotes agency through and with social relationships over shared resources (see Chapter 2). Often agency is enacted through developing configurations and infrastructures that act as alternatives or counter-mechanisms to market and state-based infrastructures.

In order for these complex, social and self-governing commons to survive, thrive and be sustainable, many conditions and relationships could be considered, and rather than trying to address all, I focus on in-depth exploration of those that arise when working with digital cultural heritage.

When looking back on and analyzing in retrospective *existing* commons, scholars have found a set of requirements and principles to be met for achieving robust and sustainable commons: "providing information, dealing with conflict, inducing rule compliance, providing infrastructure, and being prepared for change"(Ostrom 1990, Ostrom and Hess 2012, see also Dietz et al. 2003). Similarly, scholars in Science and Technology Studies (STS) have studied infrastructures ethnographically a posteriori or in points of infrastructural change or breakdown, concluded e.g. the key characteristics of information infrastructure, and proposed some moves for "reading" an infrastructure (see Star and Ruhleder 1994, 1996, Star 1999, p. 384). Yet, the challenge for participatory and interaction design scholarship aiming at contributing to *future* commons is to suggest design strategies, practices and directions that could enable and support the becoming of commons and support commoners in their pursuits. A commons, as other socio-material-technical constructions, requires a functional infrastructure to carry its different parts and functions. Therefore, I argue that the notion of infrastructing, deriving from STS and especially as articulated in contemporary PD, is a relevant conceptual and practical device for my attempts to design and assemble infrastructures for digital cultural heritage, and can be applied also to other domains dealing with collective action and share reservoirs. Infrastructuring can help to analyze how design can shape shared cultural resources and influence various actors in the cultural sector to work towards more commons-like arrangements where digital cultural heritage is collectively maintained, enriched and cared for. Learning from the cases, Fusion, EUscreen and AvoinGLAM, I suggest **infrastructuring strategies** for cultural commons that could be useful other designers and professionals aiming to operate in commons settings or commons-based frameworks both within and outside the digital cultural heritage field. Rather than directed at a specific field, the strategies learn from the field under study here but are aimed at designers and others interested in advancing collective and democratic actions.

In addition, I argue that designers could learn from the commons research traditions about how to manage, govern and sustain collective action and self-governance of common resources. Furthermore, I assert that it could be fruitful

for participatory and interaction designers to study and turn to information infrastructure studies in order to better understand the characteristics, tensions and dimensions of infrastructures and social practices related to them. Infrastructures affect how shared resources can be employed and made use of, and impact the governance of commons. Infrastructures also set the requirements how and whether the local commons is connected to regional or global systems (Ostrom and Hess 2012, p. 68). The guiding objective of my doctoral project has been to build upon these two research traditions, and the contemporary development of the notion infrastructuring. Against this background, I bring forward some infrastructuring strategies that, I argue, could contribute in part to the longevity, sustainability and robustness of a commons. These strategies have been implemented in the three design research cases of my doctoral work to reach across, on the one hand, the institutional digital cultural heritage collections, their technology systems and practices, and on the other hand the platforms through which ordinary people use, create and share digital cultural works.

The final article of my doctoral research (Article 6: Marttila and Botero 2017) implemented an analytical framing that I developed to discuss and reflect upon the infrastructural work conducted in the Fusion and EUscreen cases. In the article, we addressed particularly two interrelated concepts found from the information infrastructure discourse, namely installed base and gateways (revisit Chapter 2 for a detailed description of the concepts). I apply these concepts as useful metaphors and vehicles in collaborative infrastructural design and development aiming for commons arrangements in the cultural field. The concepts are relevant to infrastructuring processes for digital cultural heritage: Previous infrastructures provide an installed base, a foundation to a new one, and at the same time provide direction for designers and other participants for the infrastructuring efforts needed. Designed gateways, such as prototypes and experiments, allow infrastructuring processes to happen by allowing for experimentation and scenario probing. I find this orientation very useful in addressing the socio-material-technical infrastructural development for digital culture and cultural heritage, and for identifying and implementing infrastructuring strategies that could contribute to springing and becoming of cultural commons. With similar framing, although using partly different vocabulary, the AvoinGLAM case (Article 5: Marttila 2016) analyzed the open culture movement and my direct engagement in it. It did so through the following conceptual scheme that encompasses the key co-design and commoning

efforts: foundation building (i.e. probing installed base), creating a shared knowledge base and resources, framing conditions for creative re-use, and fostering and sustaining commons. In this chapter, I combine these two framings from Article 5 and 6 to all three cases to unify and synthesize the discussion of the findings and presentation of the overarching contributions of my doctoral research.

As one of the key contributions, I present four key infrastructuring strategies for cultural commons. The four strategies are elaborated from the findings of my case projects in context of digital cultural heritage as the key strategies that could contribute to the becoming of sustainable cultural commons. These strategies are:

1. probing and building upon an installed base,
2. stimulating and simulating design and use through gateways
3. producing and pooling shared resources, and
4. fostering and shaping a commons culture that supports commoning.

In the remainder of this chapter, I discuss each strategy in turn. I end the chapter with a discussion of how these principles could form part of a design orientation that I term *commons design*, outline its early principles to indicate and implicate a direction for professional design practices in PD, and point to future research areas and questions.

5.1.1 Probing and building upon the installed base

The key to understanding infrastructures for digital cultural heritage, including access to and use of it, is to address the diversity of socio-material-technical characteristics and mechanisms that can construct and contribute to cultural commons. As suggested by the STS literature, a growing infrastructure inherits both the limitations and capabilities of an installed base. Due to the heterogeneous, evolving nature of a growing infrastructure, it is important to actively probe and reveal the possible connections and interdependencies between different infrastructural elements, resources and actors (Star and Ruhleder 1994, 1996, Star 1999, Pipek and Wulf 2009 see Chapter 4 for the theoretical grounding of the notion of installed base). In my research I have devised the notion of 'installed base' as an infrastructuring strategy to probe and build upon the existing characteristics of the infrastructures in question. Doing so aids both the development of ICT systems and

the social practices and relationships connected to them, and in addition helps with finding and confirming a point of departure for the (required) design activities. In all of my three cases, multiple issues have surfaced related to the installed base. I will discuss the most important here, namely social practices, common-pool materials and legal frameworks (for a more elaborative account of these and other issues see the Articles 1,2,5,6).

In all of my cases, understanding current and emerging social informal and institutional practices in relation to digital culture and the use, creation and distribution of digital cultural heritage was a key point of departure of the design endeavor. In the development of Fusion, a lot of effort was placed on understanding the communities, their origin, history, and current and emerging social practices. The systematic selection process and mapping of small-size local 'content communities' (as they were called in project language, the term refers to communities of media practice) provided an overview of the installed base that the Fusion system would inherit. Through questionnaires, interviews and observing content community representatives, we identified the socio-material-technical characteristics of the community infrastructure, and learned that these assemblages consisted of trial-and-error experimentation with media content and media technologies, rather than a conscious development of community practices. In addition, the creative bricolage of tools, technologies and materials in communities was applied not only for communication purposes, or as basis for creative endeavors, but at the same time for archiving and media circulation. These ad-hoc and fluid practices and community activities differed significantly from the institutional and official work practices and processes of the cultural heritage institutions and archives that were part of the P2P-FUSION project. In EUscreen, the institutional work practices and professional perspectives of over 20 European organizations provided a very heterogeneous set of social/work practices that influenced the design and development of the technology platform. As discussed in relation to the EC's drive for arranging digital culture converging and integration of institutional heritage collections into 'memory institutions' (in Chapter 2), the aim of the EUscreen project was to develop common standards, practices and policies for creating access to digital audiovisual heritage, including harmonizing possible differences. Achieving alignment and some kind of coherence between the different project partners and their practices was a central design objective, as e.g. integration of an institution's subcollections to EUscreen modified not only the EUscreen collection but also the in-

stitution's work practices (e.g. curatorial processes, classification schemas, metadata standards). This alignment and common language was sought in and through various co-design events and experiments. Björgvinsson et al. (2010, 2012a, 2012b) have rightly pointed out that consensus should not necessary be the desired outcome of infrastructuring activities, and that dissonance and disagreements between different actors should be allowed. However, in project-based and time-limited technology development projects such as Fusion and EUscreen, the formal management structures and decision-making procedures did not in practice encourage or facilitate disagreement or polyphony among institutions or with potential user groups over controversial issues. The objective was to achieve unified schema and standards of selecting and representing digital cultural heritage – thus also projects depart from what we can consider an installed base.

When bringing community and institutional cultural heritage practices together, a mismatch could be expected. The discrepancies in EUscreen included both practices related to practical issues such management, distribution and enrichment of digital cultural materials (i.e. metadata, tags), as well as moral and ethical issues practiced and enacted through creation or use of digital culture, e.g. example in relation to regulatory frameworks such as understanding and respecting copyrights. Here, for example, some communities and practitioners considered publicly funded cultural materials such as news as common and therefore available for appropriation without permission while others didn't. As another example, in the community's view a 'collective ownership' (see Light et al. 2013) could form if an audiovisual production was created together even if that would not be the case in terms of copyright law (See Article 3: Marttila and Hyyppä 2014a, and Marttila and Hyyppä 2014b).

Careful attention to different installed bases, achieved through applied ethnographic methods and analyzing the multiple outcomes that existing practices are connected to in the beginning of the project, can provide a solid direction and orientation for design activities in infrastructural development and for co-constructing commons. Drawing on the experiences of EUscreen and Fusion, the objective in the AvoinGLAM case was from the beginning to acknowledge and embrace the multitude of social practices that existed among both institutions and practitioners. Nevertheless, a lot of effort was needed to understand the practices of libraries, archives and museums – something that was achieved through organizing a series of co-design workshops. To understand the rapidly changing emerging practices of practitioners and citizens interested in digital cultural heritage we, the

loose team of AvoinGLAM actives and representatives from the institutions, invited them to take part in open culture hackathons and other and co-create events. To combine these often separated practices (institutions' and practitioners'), multiple events were arranged to provide hands-on explorations of existing practice and of ways to learn from each other and work together towards a shared set of objectives or practices or goals that would not privilege any of the views.

The foundation of EUscreen was the audiovisual collections of the different participating institutions, and naturally the platform would therefore inherit the installed base of those archives and public broadcast corporations. These included a wide variety of issues including the abovementioned institutional work practices, and multi-lingual and multi-cultural aspects. However, the biggest challenge posed to the EUscreen platform design was the disharmony and restrictions that copyrights and terms of use introduced into the pooled audiovisual collection. The *Intellectual Property and Rights issues Survey* for EUscreen intended to clarify the installed base that the platform would have to take into account – the rights attached to content in the EUscreen collection, the possibilities for technology design, the possibilities for use and appropriation the archival content. The survey included questions on each organization's content selection and copyrights clearance procedures (see Article 3: Marttila and Hyyppä 2014a for in depth presentation and analysis). In addition to the survey, a set of thematic interviews on open collection were conducted with selected institutions. This active probing of the installed base of the participating organizations' audiovisual collections that would be pooled together helped us to understand the scope of rights, the conditions surrounding the media content and, more importantly, what the future visitors of the platform could actually do, and how – if at all – it would be possible to appropriate content from the EUscreen collection. Interestingly, the interviews revealed that, often, institutional views on open access to and use of digitized cultural heritage differed from the views of the individual professionals working in these institutions. This means that in terms of political commitments, there is often a very mixed installed base for infrastructural development. Legal issues revolving around copyrights were also present in the installed base of Fusion, although in very different ways. Here, content communities' understanding of ownership of both cultural materials found online, and of self-created creative materials was probed and practiced through social agreements and through personal value systems rather than following the present legislation. This diversity in perspectives

and understanding about copyright issues was for me a key inspiration and motivation for the AvoinGLAM case.

In both Fusion and EUscreen, the installed base significantly influenced the design and development of the systems. A lot of time was invested in doing infrastructuring work on two levels: first, reconfiguring and redesigning the connection points with and between actors and resources and, second, the integration – or simulation – of these different parts. In Fusion, particular attention was paid to the communities and their practices, and to connecting them with institutional practices and processes. As these practices varied vastly, connecting practices became a learning process for both institutions and communities. In EUscreen, in contrast, the foundation for infrastructural development was laid in the institutional processes and the audiovisual content provided by the participating institutions.

To make the claim more concrete, let us review how practices as installed base were probed in Fusion. The project's objective was to design *community application concepts* for Fusion, and technological offerings according to the needs and wishes of the communities, placing the offerings of the institutions as secondary. The Fusion co-design process was carried out in three different countries, Finland, Hungary and in the Netherlands, and consisted of local and international workshops (see section 3.6.1). The community application concept document was a collectively produced plan elaborated in co-design sessions together with the community representatives. This plan outlined the key practices and requirements regarding media distribution and use, and included a set of features and functionalities deemed important by the community. The purpose of the concept document was twofold. First, it provided input and implications to the software design and priority to implementation. Second, it informed the project of the complex media practices of the project communities, and of their views on themes such as authority (e.g. who makes decisions?), division of labor (who records the videos?) and authorship (who is credited for the work?). The concepts were presented and discussed in an international co-design workshop including project partners and representatives from communities from different countries. As a result, the preliminary concepts were consolidated into three *Pilot application concepts*. However, in reality and in retrospect, the participating communities had little power over e.g. what software was developed, in comparison to the project partners, especially those who were software programmers. Bratteteig and Wagner (2016a, 2016b) explore decision-making in participatory design projects, and question what it is precisely that par-

ticipants can have a say in. They conclude that participants do not necessarily need to take part in all choices or design decisions in order for a project or its outcomes to be participatory. Nevertheless, as also noted by Bratteteig and Wagner, the designers are (most often) in a powerful position vis-à-vis participants (Bratteteig and Wagner 2016a, p. 32).

A key finding with these infrastructural initiatives was the comprehension that if we adopt an understanding of infrastructuring as a long-term relational process, contributing to the emergence of cultural commons cannot be carried out by relying solely on technological or social aspects. Instead, many other relevant factors and actors, and their relationships, resources and processes have to be identified, brought into contact and linked together in a strategy that considers cultures, content and heritage, communities and institutions, and the technologies that can weave them together – and perhaps this strategy then needs to be 'released' after its initial development, in order to be collectively reconfigured. Seeing infrastructuring in this light has connotations to the concept of "knotworking" – a process of intersectional collective ways of organizing activities within loosely knit actors and systems in improvised ways – proposed by Yrjö Engeström. He defines knotworking as "a longitudinal process in which knots are formed, dissolved, and reformed as the object is co-configured time and time again, typically with no clear deadline or fixed end point (Engeström 2000, p. 973). This comprehension of the role of ad hoc arrangements and social (re)configurations in relation to cultural production and the pooling of digital cultural heritage, derived from the practical design work done in EUscreen and Fusion, was one of the central reasons for me to initiate the AvoinGLAM network in Finland.[42]

As in the design of Fusion and EUscreen platforms, the collaborative design process in AvoinGLAM was initiated with an aim to gather and understand the installed base originating from the various culture and memory institutions, and their respective infrastructures. In order to obtain this information, we, the team, designed an event format in which, after a presentation of open culture, participants would go through five different 'assignments' in groups: mapping existing actors, initiatives and resources, discussing 'what openness means' for them, and

42 Similar approach for setting collaborations with institutes and citizens, and bringing people together from diverse disciplines and sometimes conflicting interests have been carried out in other contexts, e.g. in Malmö Living Labs.

what the implications of opening institutional practices and cultural materials to the wider public could be. Altogether 7 workshops in different cities in Finland brought representatives from local libraries, archives and museums together with usually 1—2 participants from Open Knowledge Finland, the NGO that hosts AvoinGLAM. I led five of these workshops. All these workshops were organized in collaboration with a local cultural institution that invited other stakeholders, that they considered relevant, from the area to join.

Surprisingly, I learned during the process that there had been very little collaboration among cultural and heritage institutions in Finland, both on local and national level, even if these cultural organizations were physically situated next to one another. Hence, infrastructuring efforts were directed to strengthen the basic infrastructural layer that could facilitate interaction and collaboration between institutions. In practical terms, e.g. a joint roadmap for shared objectives and activities was co-produced with local and regional cultural institutions. Several other findings related to the installed base of Finnish cultural institutions were made when staging these events, including both the practical challenges institutions faced (such as an inventory of issues hindering opening digital cultural heritage and data), and more moral and ethical considerations. These key findings are documented and shared within AvoinGLAM and published in form of a booklet and academic papers. (Findings are discussed in depth in Article 6: Marttila 2016, Salgado and Marttila 2013, Marttila and Sillanpää 2014.) Probing the installed bases of various cultural institutions provided guidance for and direction to the AvoinGLAM related work, and for me, as an activist academic and participatory designer, it helped to steer the infrastructuring activities undertaken. To give a concrete example, one of the main obstacles for opening cultural data and content was, according to the institutions, the lack of in-house knowledge and competence. This concrete obstacle identified by the institutional community led me to plan, seek funding for and finally conduct an open culture master-class for art and culture institutions, together with colleagues from Open Knowledge.

A key finding here, and thus one of the contributions from my work, is that engagement with the concept of installed base is useful for identifying and reviewing in depth the components and characteristics of existing infrastructures, including how they are brought into being and put to use. This forms the point of departure for the infrastructural change that all three design research cases were aiming for. Probing an installed base can also reveal which controversies, conflicts and

contradictions are inherited from it and, in turn, influence the design contexts at hand. With this remark I am not indicating that consensus in infrastructural work should necessarily be the goal, a note also pointed out by the commons scholars and scholars working with similar issues within PD or CSCW (for more on this, please revisit Chapter 3). Active probing and understanding of an infrastructure's installed base is useful in the design and development process, as it helps to better identify infrastructural challenges and orientate infrastructuring activities aimed at building future infrastructures and fostering infrastructural change. Therefore, it is important to pay attention to social issues such as practices, rituals, agreements, tacit knowledge, not only to technological infrastructure and technological solutions. A more nuanced account of the benefits of probing the installed base is developed in Articles 5 & 6 (Marttila 2016, Marttila and Botero 2017).

5.1.2 Stimulating and simulating design and use through gateways

The experiences obtained from the three cases confirm that for infrastructural development and infrastructural change, it is essential to bring together and connect otherwise incompatible socio-material-technical infrastructures, actors and practices. This echoes the identified need to pay special attention to "bridging the gap between technology development and appropriation" (Pipek and Wulf 2009, p. 467) but in contrast to this, puts the focus on future development. In the information infrastructure studies literature, the concept of gateway usually refers to a technology that combines two unfitting entities together. (See Chapter 2 for a detailed description). In this dissertation, I understand gateways in a more metaphorical way. A gateway is considered as an opening and a passage connecting and giving access to otherwise incompatible parts, such as community media collection and institutional cultural heritage. A term related to gateway is Botero and Saad-Sulonen's (2010) concept of in-between infrastructure. Here, I extend their term with help from the idea of 'the becoming of' an infrastructure (Karasti and Baker 2004, see also Stuedahl et al. 2016a), to denote arrangements and experiments that enable explorations between heterogeneous systems and with different actors and their practices *before* an actual infrastructure or its future practices have been settled.

In all three cases, even if for different reasons, creating so-called workarounds, ad-hoc arrangements, experiments, demos and pilot projects became an essential

part of the infrastructural work. These design experiments informed and offered implications for the design cases at hand. My reflections from the experiments influenced both the framing of the *research questions* for each phase of my work, and the *program* (i.e. the activist academic position, to use the vocabulary suggested by Brandt and Binder (2008)). When discussing these infrastructuring efforts, I use the term gateway to underscore the qualities of connecting and giving access that characterized these efforts. In Fusion, the prototypes (both paper and functional) and software pilots (e.g. Community TV application) were called for in order to simulate and stimulate future uses and practices (this includes both the creative re-use of media and end-user development), because the technology development was hindered by the limitations encountered in key technologies, by challenges in connecting to technology layers, and by other interoperability issues. Other non-technological infrastructuring efforts here included e.g. creating a toy-like design game to aid the creation of a common understanding and shared vocabulary of the current and possible new media practices. The design game as an infrastructuring strategy was applied in the design-before-use stage, and was aimed at mapping how the community's practices and tools are linked to other actors, resources and technologies. The evaluation and validation of these prototypes was carried out collaboratively - e.g. through paper prototyping sessions with invited participants, where one interaction designer was moderating the session on manipulating the paper elements according to the choices and moves of participants. In parallel to the paper prototyping, some functionalities (e.g. video annotation) were explored using another low-fidelity prototype, which was inspired by the Video Whiteboard method coined by Tang and Minneman (1991). After reviewing and analyzing the sessions, the findings were translated to e.g. wireframe designs.

In addition to using PD techniques and tools as gateways, the project experimented with several concrete technical gateways, e.g. WebBridge, to provide an interface between the peer-to-peer Fusion system and the Web. This gateway was deemed necessary by many of the co-design participants and community representatives, because they already had an online presence that they wanted to maintain; it was part of the installed base that the project built upon. Another socio-technical gateway designed for Fusion was the Archival integration component developed for an audiovisual archive participating in the project. This component aimed to integrate community created content from online platforms with the project partner archive's own sub-collection and technology system. This proof-

of-concept enhanced the archive's understanding of requirements, problems and potentials for such an integration in the future (i.e. what kind of collective action, practices and agreements would be needed for such a function to exist in the future?). (See Article 1: Marttila et al. 2011 for details of the SMAK toys design-game, and Article 6: Marttila and Botero 2017 for detailed account for the gateways developed for Fusion).

In EUscreen, the creative workarounds and ad-hoc arrangements were mainly called for due to the intellectual property issues (e.g. legal contracts, privacy issues and copyrights) related to the platform and to the audiovisual collection. These gateways were to demonstrate the value of emerging media practices and creative re-use of digital audiovisual heritage, even if they might have been in conflict with the current legislation (see Article 6: Marttila and Botero 2017 for account for the developed gateways in EUscreen).

To bypass some of the limitations of EUscreen's installed base, the project developed multiple participatory design processes such as the co-design process of the Virtual Exhibition (VE) builder prototype (an online editor for creating exhibitions) to rehearse and practice curating and creating audiovisual exhibitions from various sources. The VE builder implies that while the tool was solely dedicated for creating online exhibitions, the functionalities of the tool could be adapted to different contexts. The VE builder acted as an 'in-between infrastructure' that connected parts from a content-management system, an audiovisual collection and the portal's interface. Often the purpose of gateways is to 'hide' the complex infrastructure and make the use 'effortless'. The VE builder had a similar aim as it sought to camouflage the challenging IP issues from the users.

Similarly, as the download of materials from EUscreen was not possible, a prototype for exploring open and creative re-use scenarios was carried out on another platform for video hosting and sharing. This experiment gave participating archives a practical and, according to them positive, experience of what opening a digital cultural heritage collection could entail in the future.

Another example of a gateway arrangement in EUscreen is the hands-on participatory video remix workshops License to Remix! and Make Open Video. While the first workshop's objective was to understand young adults' 'legal' remixing practices in comparison to an 'anything goes' approach, where any material available online is used, regardless of copyright issues (see Marttila and Hyyppä 2014b), the second workshop focused on exploring open video content and metadata as a ver-

satile creative medium with invited expert users from various fields linked to digital audiovisual media (Remix Helsinki 2014). Participant observations and interviews conducted at the end of the workshop provided valuable insight to practices related remixing and combining video with open data. To give a concrete example here, remixers/hackers considered that giving attribution is not only a technical maneuver choosing a license. Attitudes towards crediting original authors varied a lot based on the source of original materials, for example makers of political remixes did not see listing sources relevant (Marttila and Hyyppä 2014b). Creating in-between infrastructures to bridge different incompatible socio-technical entities and collaboratively building capabilities through gateways proved to be an important infrastructuring strategy. First and foremost, this was due to the value of rehearsing, enacting and negotiating desirable future scenarios through critical making in a real-life, however somewhat secure and controlled, environment.

In the context of AvoinGLAM, gateways were aimed at fostering long-term participation and creating conditions for collaboration, appropriation and creative re-use activities. For example, the Open Cultural Data Master Class was initiated for mastering issues related to open cultural content and data, including how to open digital cultural heritage in practice, by experimenting and learning together. The course was called for as through the series of workshops participants expressed a need for increasing the level of knowledge and skills regarding open cultural data within the cultural institutions, as well as for obtaining more hands-on experience with novel digital technologies. From my view, however, the main focus was to provide a structured means and a framework for collaboration and enhanced peer-learning, and to share practical ways and find common principles for how a GLAM institution could be more open. Over 20 participants from different GLAM institutions throughout Finland participated the Master Class. Participating organizations released open digitized cultural heritage of data under a Creative Commons license (CC BY or CC BY-SA) or under Public Domain. In addition, during the 5-month course participants conducted different assignments and trials related to open cultural data, such as hands-on exercises on making animated GIFs or interactive maps and videos online. Around the Master Class, a series of digital tools were set up and configured to enable distributed collaborative work and sharing. Use of these tools often required skills and practices that were foreign to many of the participants, such as the collaborative asynchronous writing/editing of online documents (through, e.g. Google documents) and the practice of sharing

unfinished texts publicly with peers and professional networks, which was often very different from their regular organizational practices. Several participants had to adopt and learn, in addition to the secrets of open cultural data, a whole new set of new digital tools and work practices.

These circumstances with the AvoinGLAM case bring associations of the beginning of Scandinavian PD to mind. The early projects considered that the pursuit of capitalist interests and labor practices leads to 'deskilling' (Ehn and Kyng 1987, Kyng 2010). Deskilling here refers to an activity where introduction of new technologies to lower costs result in that less skills are required from workers, their control over their own work decreases, and especially situated and integrated skills are in danger of being lost (cf. Baverman 1974). As discussed earlier in this chapter, digitalization has profoundly transformed – and continues to reshape – cultural heritage institutions as well as the related institutional and individual professional practices and processes. In the mesh of 'being digital' demands, additional requirements for 'being open' have come into play. Already the early co-design workshops with participants from the cultural heritage and collecting institutions communicated that many skilled professionals within the organizations worried the change embracing 'openness' would bring to their profession. This message has become stronger also in our later research (see Sillanpää 2016).

Looking in retrospect, most of the PD efforts in AvoinGLAM were aimed precisely at 'up-skilling' participants and enabling and supporting new capabilities amongst the professionals coming from collecting and cultural heritage institutions, design professionals, and practitioners of cultural productions. The empirical cases thus point to that up-skilling will be an important task for designers aiming to operate in and contribute to commons-like settings, similar to how Dearden and Light (2008) have identified that one emerging role of a designer is to 'up-skill' participants in PD projects.

Despite the success[43] of the Master Class, the AvoinGLAM movement, in my opinion, still lacked a good set of local examples of the benefits of opening digitized cultural heritage and data, or demonstrations of how citizens could use the

43 Success is of course relational, however in addition to the collections of Finnish digital cultural heritage and a vibrant community of open culture experts. The Open Cultural Data Master Class won an honorary mention for the Archival Act of the year in 2014 (in Finnish Vuoden arkistoteko).

newly released open digital collections. To produce these examples, we developed an open culture hackathon – a portmanteau of the words hack and marathon – called *Hack4FI – Hack your heritage!* to increase the creative re-use of open resources. A secondary objective for the initiative, from my view, was to create conditions for fruitful collaboration and appropriation of Finnish open cultural materials in a setting that was both amateur and multi-professional. In addition, the hackathon allowed for experimenting with new cultural forms and practices, e.g. printing 3D models out from heritage objects or creating 'video poetry' through collaboration between poets and video artists. These kinds of rehearsals and 'trying-out' collaborations between heritage institutions, practitioners and other actors in 'safe' and staged settings nurtured stakeholders' embodied understanding of possible future practices, and perhaps also their understanding of the value and potential of these novel collective arrangements and creative activities. (Article 5: Marttila 2016 discusses more in detail the gateways and design experiments carried out in the AvoinGLAM case).

Bridging silos of pooled common-pool resources and the social practices connected to them proved to be a fruitful strategy in all three initiatives. By configuring situations and events, such as a participatory video remix workshop for young people, rehearsing the creation of virtual exhibitions with cultural heritage professionals and researchers, or creating the conditions for collaboration and peer-learning, individuals and institutions together envisioned what an alternative infrastructure and desirable future could be – without having to strictly obey current socio-technical or legal constraints. Weaving together contexts, social practices and language, often from significantly different work practices, is an important part of the work done to achieve the socio-material-technical infrastructures that could support cultural commons. As mentioned before, many benefits became apparent from such gateways, such as giving institutions a sense of the requirements for accommodating emerging media practices prevalent among a wider public and, in turn, giving individuals and communities a sense of potential novel ways to interact with digital heritage collections. However, this approach can have also some drawbacks and create frustrations among individuals and institutions. To speculate – as this kind of frustrations has not come up in any of the cases - participants could develop gateway practices that cannot be performed or enacted in the 'real-world', and thus become frustrated with the uselessness of it all. Some would perhaps argue that the gateway approach could encourage disobeying rules or en-

gaging in non-legal activities. To respond, I would like to underscore firstly that the world-as-it-is is, seen from my position as an activist academic and designer, nothing more than the installed base for the future infrastructure – becoming frustrated with it and wanting to change status quo is part and parcel of recognizing that design is political. Secondly, stimulating and supporting legal creative reuse was the prime objective in all of the cases.

A key finding from applying the notion of gateway in infrastructural work and as contributing to cultural commons is the experience that gateways can be used as a practical infrastructuring strategy that can help identify and locate incompatible socio-technical infrastructures and practices, and give direction and orientation to the design workarounds, experiments and pilots necessary to bridge them. Gateways are also a useful tool to consider when designing new configurations, as they help stimulating and simulating future practices and arrangements. Learning from the three cases, I argue that initiatives that aim to support revitalization of cultural heritage through digitization should put more effort and care on the collaborative dimensions that their platforms and technologies are aimed for or enable. The experiences obtained from the three cases also point to the importance of building bridges between silos, which include common-pool resources, technologies and various actors, as well as weaving together different contexts and social practices. Bridging between silos, as a gateway and infrastructuring strategy, on the one hand, contributes to infrastructural change or growth by creating links between unexpected or incompatible parts, practices and actors, and by connecting local community components to institutional frames or even to global systems (e.g. Wikipedia). On the other hand, through gateways, locally pooled and maintained common-pool resources can be linked to other collections and catalogues, and/or to technology systems that can enable e.g. more transparent means for governance and maintenance.

Furthermore, through the empirical material discussed in the original research articles (see Appendix 1 or summary in Chapter 4), I argue that it is valuable for a growing infrastructure to arrange socio-material-technical workarounds, ad-hoc arrangements and prototypes in order to envision and rehearse the current and emerging social practices. These explorations and experiments have a specific role in enhancing both technologies and social practices, and further, in these staged instances different stakeholders and entities have a possibility to create common ground – or bring forward and negotiate confrontational issues – and pool re-

sources. Furthermore, they open an avenue for socially organized and governed commons arrangements. Through the experiences gained in Fusion and EUscreen, I argue that if adequate and flexible gateways can be proposed during the technology development for digital cultural heritage, there is a potential for developing practices more alike to a cultural commons. A good indication of this possibility is, for example, that in the co-creation and hands-on events we conducted, participants spontaneously began to pool and link resources (e.g. content, tools, best practices), and to develop and adopt commoning practices to manage, govern and sustain the shared resources. These participants' efforts were not primarily serving self-interests but rather directed at the common good of the group of people in question. Similarly, open-ended and fluid co-design processes that are not fixed in project-time or fixated at pre-determined outcomes could invite more commoners to contribute common and shared resources.

Even if not all of the gateways developed in the cases could directly feed into or become a part of the infrastructure in question – e.g. as a form of practice, service or technology – I argue that they can play an important role in long-term design orientation of cultural commons. This is because they provide an environment where complex matters related to shared and common resources such as trust, ownership, values and motivations can be contemplated, experimented with and assessed. Digital cultural heritage initiatives, when not only concerned with preserving and creating access to digital cultural heritage, can become catalysts in the construction of shared cultural resources that also enable collaboration between diverse audiences. Doing the work of participatory and collaborative infrastructuring can make visible discussions of and frictions over what is useful and necessary in a given context, and over what can be considered cultural commons and for whom. If digital cultural heritage initiatives take the collaborative dimensions of infrastructuring more seriously into consideration, then I believe that the likelihood of nurturing sustainable cultural commons improves.

To summarize, the experiences gained from the two information infrastructural initiatives considered here, Fusion and EUscreen, and the AvoinGLAM open culture movement show the relevance of creating gateways and in-between infrastructures to connect otherwise incompatible socio-material-technical infrastructures and practices. In these cases, current and emerging media practices were rehearsed with various user groups and stakeholders through in-between infrastructures and assemblies of patched configurations of existing software tools

and audiovisual media content. These gateways – in the form of pilot applications, events, prototypes, and ad-hoc workarounds – enabled the advancement of particular pieces of the infrastructure, but more importantly they supported the process of evolving social practices. Gateways sometimes even contributed to changing values and attitudes among the people taking part in the infrastructuring process. Even if all of the qualities addressed and explored by the projects' in-between infrastructures and gateways were not implemented in the technology platforms, or did not become part of the practices of cultural heritage institutions, communities or individuals, it is probable that they will, as experiences or scenarios, be a part of the installed base of similar infrastructures in the future. It is my hope that they will thus contribute to creating awareness of the need for cultural commons.

5.1.3 Producing and pooling shared resources

Common and shared resources are a prerequisite for a commons, in which the governance of and caring for the resource is collectively configured. In environmental commons (e.g. forests, seas) the shared resources often already exist, while in digital knowledge and cultural commons they are produced by or accumulated from various sources by many actors, or are created collaboratively. Through its design research cases, this doctoral dissertation argues and verifies that producing and pooling shared resources, both cultural materials and knowledge reservoirs, is one of the key infrastructuring strategies for constructing and contributing to cultural commons. In the cases, the focus was on intangible resources, e.g. digital culture and cultural heritage, knowledge and information pools and other digital materials, and not on the physical cultural heritage artefacts and objects.

Digital cultural heritage resources are often provided, selected and pooled by official institutions. These collections emerge through institutional processes of inclusion and exclusion that determine which cultural heritage materials are digitized or which 'digital-born' materials are preserved, archived and catalogued. Consequently, these institutions and their governing public bodies often set the terms and rules of participation. A key insight from the cases is the need to question and pay more attention to how and why the cultural material is designated as 'cultural heritage' in the first place. This very act of designation and definition can potentially lead to conflicts and long-term frictions. However sometimes the

processes are not governed as rigorous processes as we might think. As discussed earlier, in EUscreen the content and form of the European digital audiovisual heritage collection was largely directed by copyrights. The EUscreen project had set a content selection policy and framework. In order to understand the status quo of the audiovisual collections and probe the limits of their use, the *EUscreen content selection policy questionnaire* and the already mentioned *Intellectual Property and Rights issues Survey* were implemented. The surveys revealed that copyrights clearly influence the content selection process. Due to rights issues, the majority of the content chosen to the EUscreen portal consisted of news and current affairs programs. The thematic or historical value of the audiovisual material was overruled by copyright considerations, as the representatives of the institutions considered rights clearance process too laborious and/or expensive. (Article 3: Marttila and Hyyppä 2014a).

Similarly, in the context of AvoinGLAM, many Finnish cultural institutions created open access to those sub-collections or individual items that had no known copyrights attached to them, while only rarely in these early releases the relevance of a theme played a major role in the selection process. In all the cases, the collections/catalogues of digitized cultural heritage were constructed and developed by the institutions, although following the gateway experiments in AvoinGLAM, some institutions encouraged social enrichment on external platforms not synced or integrated with their official systems (e.g. adding tags comments to pictures on Flickr, or writing Wikipedia entries about cultural artefacts from their collections).

Björgvinsson (2014) has noted that Participatory Design (PD) lacks an acknowledgement of how local issues are nested in wider social systems, as well as in national and international issues. In a similar manner, I argue that the relations between different local, national and international needs should not be overlooked when we are aiming to consciously develop cultural commons, as locally and nationally created and nurtured collections of digital culture (both institutional and everyday arrangements) are subject to third-party commercial interests and commodification when harvested for a worldwide technological infrastructure. When local or national collections become part of a commercial driven infrastructure or open infrastructure, they are subjected to the terms/rules of use that people cannot influence themselves. Early Scandinavian PD projects had a strong local emphasis and aimed to cater for local needs (Bjerknes et al. 1987, Ehn 1988, Ehn and Kyng 1987, Greenbaum and Kyng 1991), and perhaps because of this history, PD has not

been attentive to developing convincing methods and approaches to expand or scale up the initiatives. Star and Ruhleder (1996) argue that "an infrastructure occurs when the tension between local and global is resolved" (p. 114).

In the three cases in this dissertation, tensions arose precisely between local and global issues, tensions which the design research initiatives could not settle. This friction was most clearly present in the AvoinGLAM. In Article 5 (Marttila 2016), I discuss how in the current cultural and technological environment, commoning and creative practices are relying increasingly on commercial digital platforms and websites. These are often governed and regulated by commercially motivated terms of use that commoners – who have created and pooled common-pool resources – are not able to negotiate among themselves. The result is that the terms of use and regulations are not well matched to local needs and conditions, but are instead geared towards making profit rather than sustaining cultural commons.

In the article, I give the concrete example of Finnish cultural institutions releasing open catalogues onto the Flickr image and video hosting service under Creative Commons license, and often if the IP issues permitted, on the Flickr Commons under no-known copyright mark. After publishing these open culture collections, some institutions realized that third party actors were selling the images on another commercial platform, and in some cases claiming rights to these pictures. Despite the Finnish cultural institutions' persistent efforts and repeated requests for removing the materials from online stock photo shops, the selling and watermarking of these images continues. Even if from the point of view of law, it is not illegal to put on sale photographs where the copyrights have expired, institutions felt that it is morally wrong and that it is frustrating the aim to develop open cultural commons.

Another reminder of possible tensions between local and global, is found in the online activities of the AvoinGLAM's movement. The majority of the movement's online activities take place on Google or Facebook services, which means that the activities and knowledge that they generate are subjected to the commercial interest of these multi-national corporations. Corporations' agenda for commodification of user generated data and culture creates tensions between the service providers and the commoning practices aiming at open cultural commons (Article 5: Marttila 2016). However, there are also good examples of how to address the challenges related to the space/time and local/global tensions of cultural commons. One of them is the well-known Creative Commons license framework and the

associated technology tools for distributing cultural works. This design solution is partial, however, because in order to work, the licenses require other components of the infrastructure to work in a compatible fashion. Nevertheless, locally settled rules and practices – agreed on institutional level or within communities – are under pressure when locally pooled and produced common-pool resources are made globally accessible and subject to use and appropriation.

In all of the cases copyright and other intellectual property and rights issues played a crucial part, through its role in technology development in the Fusion and EUscreen cases, and through being a key controversy around which the AvoinGLAM movement was built partly as a counter-narrative. In Fusion, the fundamental aim was to facilitate legal creative re-use through a technology system and a software toolkit. However, the rigid legal approach introduced by the project was at times in conflict with the communities' values and media practices. Moreover, some of the design decisions in the project aimed to change these community practices and, for example, imposed a mandatory Creative Commons license selection tool for all uploaded audiovisual media materials. Yet, in retrospective, this proved to be working against the basic principles for constructing a robust and enduring commons (cf. Ostrom 1990), namely that people should be able to take part in providing and negotiating the rules of their common-pool resources, and to fit them to the local conditions. In EUscreen, as has been already discussed extensively, copyright issues imposed major challenges on the design of platforms for making digital audiovisual materials accessible for creative use and appropriation. Copyrights, even when fairly liberal, shaped both the design of the platforms and the selection of audiovisual content for them, thus presenting practical challenges for professional media design and software development aimed at public participation and collaboration between different user groups and official institutions. The project's legal framework and the portal's terms-of-use fundamentally determined how people could take part in building digital cultural commons for audiovisual heritage and whether and how they could develop their understanding of our shared history. In Article 3 we argue that when copyrights guide the selection and use of archival and historical content, rather than selection criteria (e.g. of themes or events such as art, conflicts), this shared collection of audiovisual heritage becomes distorted and legalistic rather than driven by the interests of citizens or commoners. Furthermore, if cultural heritage institutions select items to be digitized and shared based on what they have cleared rights to and not based

on what could be relevant and/or representative, our common digital cultural heritage becomes only a fraction of the size that it could be. Another point to bring forward is the troubling and questionable phenomenon that some institutions and initiatives dealing with digital cultural heritage have 're-introduced' copyright to works that are already under Public Domain mark (or marked as no-known-copyrights), often by re-licensing works under Creative Commons license *even if* the rights have expired, or/and even if the institution did not hold the rights from the beginning. The institutional wish to receive attribution for and gain recognition of its preservation and digitization efforts (using e.g. CC BY attribution license on the digital photos) is, first of all, mixing the copyright law with brand/reputation development and authors right/rights holders "moral right" to acknowledgement. Secondly, it endangers the pooling of open and sustainable cultural commons, and thus works to further rather than limit the enclosure of cultural commons. When copyrights guide *what* cultural heritage is digitized to represent our culture and history, and *how* people can creatively use it, does this then create a society of dementia or amnesia rather than a lively environment where different views can be used in debating our culture and history? This train of thought and viewpoint is not just an academic way of discussing collective memory and cultural heritage, it is sustained by real-life legal trials and threats of trials against people who are creatively making use of digital cultural heritage material online. Some memories and ways of remembering may become illegal due to unavoidable copyright infringements, and/or 'fabricated' copyrights (Marttila and Hyyppä 2014a).

In addition to the digital culture and cultural heritage collections created and made available in the cases, multiple other resources were produced or pooled to serve communities in Fusion and EUscreen, and the AvoinGLAM movement. For example, in the AvoinGLAM case, the network constructed a reservoir of collaboratively produced knowledge (e.g., best practices, shared principles) and acted as a community resource for collective problem solving for peers through online platforms. These resources became sites where collaborative infrastructuring and commoning took place. Resources anchored and organized these activities, and made the documentation of the collectively developed novel commoning practices easier. Comparably, in Fusion and EUscreen a lot of articulation and mediation work was required in order to increase shared understanding between various parties in the projects. As an infrastructuring strategy, various shared information resources were compiled for different actors (e.g. community members and other end-user

developers, cultural heritage institutions) in the form of wiki-based learning resources and blogs. The experience with these information resources was that, if the resources are not interwoven with users' practices, and updated regularly, they lose their nature of being collective resources supporting the construction of commons. In addition, in the two open-source technology platform initiatives, the designed software offerings were released under open licenses on a third-party technology platform. This infrastructuring strategy aimed at enabling and encouraging future, and yet still unknown, creative re-use activities.

A key takeaway when constructing common-pool resources for digital cultural heritage and for cultural commons is the need to consider the following questions: How is it possible to introduce more collaborative and democratic approaches for selecting what is digitized and made accessible among the different stakeholders? Are copyrights, or other legal issues, directing and limiting institutional and/or practitioners' actions? Do the common resources that the appropriation and production of future works is based on support open-ended spin-offs and "forking" (i.e. enabling new independent initiatives)? And, from a more technical viewpoint, how is the quality and unity of metadata attached to digital heritage materials for enabling their later use and their use in relation to other resources (e.g. databases)?

Infrastructuring processes can deeply influence commons and the infrastructures that carry them, including questions of to whom they belong, to whom their rules apply, and who gets to participate in setting those rules. This leads us to the fourth critical infrastructuring strategy for cultural commons: how to enable and support a commons culture, which is discussed next.

5.2 Fostering and shaping a commons culture

Earlier in this chapter, I have described and discussed some key infrastructuring strategies for cultural commons, building upon the notions of installed base, gateways, and of pooling common-pool resources, each of which were employed in the three design research cases. The fourth "strategy" – or perhaps rather a designerly viewpoint – is stemming from my experiences and reflections of co-constituting "commons culture" in the cases, especially in AvoinGLAM. Here, a commons culture refers to a unique set of social practices and conditions of people who are

taking part in socially managing, caring for, and sustaining commons. Collective action towards commons is at the center of shaping the everyday 'culture' for maintaining, nurturing and sustaining commons. Throughout the introductory chapter I have applied a phrase 'socially arranged and managed' to convey the rich set of nuanced social connections, configurations, practices, rituals and traditions which are rooted both in commons and infrastructures. Through the empirical cases, I discussed some of the key aspects to consider when supporting and shaping a commons culture. While doing so I aimed to discuss two central questions that have been scantly addressed in PD discourse: First, how to enhance and enable long-term and scalable/forkable initiatives rather than catering for individual projects, situated action or *only* local needs. Second, how to better address social dilemmas commonly related to commons or their becoming?

My take on commons culture builds upon two articulations, one originating from cultural theorist and media designer Anne Balsamo (2011), and the other from the practice-based reflections of commoners with a more activist grounding (Bollier and Helfrich 2012, 2014, Pór 2012). Here, commoning — introduced and discussed in Chapter 2 of this thesis, and discussed in Articles 4,5 and 6 — is at the core of a commons culture, and describes activity in which people create, care, maintain and manage resources collectively. Connected to this, Balsamo argues that when new artefacts, systems and technologies are developed, we are at the same time designing cultures and creating conditions for the future. She also calls for taking culture(s) seriously in the design and development of technologies, and encourages — as many other in the design research discipline — more multidisciplinary collaboration among different parties. These collaborations across professions and domains — she argues — need to seriously consider questions of ethics and social and cultural good when innovating and engaging in future-making. The role for designers is to act as "cultural mediators by translating among languages, materials, and people, to produce — among other things taste, meaning, desire and coherence" (Balsamo 2011, p. 11, cf. Bourdieu 1983).

Cultural commons and common-pool resources of digital cultural heritage are commonly linked to distributed cooperation and production systems on the Internet that rely on digital resources. In "commons-based peer production", people often voluntarily contribute to the common good and common objectives, rather than engaging in self-serving goals and motivations (Benkler 2006, Benkler and Nissenbaum 2006). The abundance of studies of open source software

projects confirms that ethics and culture are paramount to the success or failure of these initiatives (for varying perspectives see e.g. Raymond 1999, Himanen 2001, Weber 2004). I build upon this body of knowledge and these insights when discussing how to support and shape a commons culture in the three design research cases.

Among scholars, especially in STS, it is widely accepted that technologies are not neutral, and that morals and values are built into them (Slota and Bowker 2016). For designers aiming for co-constructing commons for digital cultural heritage, different dimensions of commons culture have to be considered. First, the cultural attitudes regarding design and development of technology: e.g. what is a culture for design and development, and how does it determine in which ways others – professionals and non-experts – can contribute? Second, the culture of construction and pooling of common-pool cultural materials; e.g. what is considered 'normal' processes of selection of digital cultural heritage, and who can take part in these processes? And thirdly, the culture of caring for and sustaining commons: e.g. what is the mundane culture for current and future use and appropriation of common resources, and for collectively negotiating these issues?

5.2.1 From rules-in-use to cultures-in-use

As discussed earlier in this chapter, the installed base of an evolving infrastructure, including its informal and formal rules and social norms, are a foundation also for an infrastructural culture, and a commons culture. One of the key findings of the established commons-research tradition focusing on natural resources is that a rich and very specific set of rules has been in use in resilient commons over a long period of time. These rules were well matched with local needs and conditions, and people using and sustaining the commons had possibilities to negotiate these rules (Ostrom 1990, Hess and Ostrom 2007, p. 7). However it is often so, and this is also demonstrated in the three cases, that rather than being explicitly defined and stated, these rules tend to arise from social practices and interactions among people connected to particular resources. One key infrastructuring strategy for contributing to a commons culture is then to work towards collectively cultivating, refining and rehearsing ways of articulating and negotiating the terms of use and/or rules of participation. Ideally, if the process is successful, the rules-in-use will with time become cultures-in-use.

Photos by AvoinGLAM (CC BY-SA 3.0).

All the AvoinGLAM workshops ended with a joint collaborative session to produce a shared vision and roadmap for the near future. The objective was to collectively articulate and negotiate the possible desirable futures, and at the same time, to propose concrete actions and collaborations with the local and international actors. In addition, the aim was to support and facilitate a commons culture, and how individuals and institutions could socially arrange and manage digital cultural heritage materials and practices around them in more open and collective terms.

In both the Fusion and EUscreen cases, the terms of use or 'rules' were not collaboratively negotiated. The boundaries of common-pool resources and rules-in-use were defined, sometimes even dictated, by the project partners. Even if the rules were partly formal and party informal, the formal social agreements, such as a license agreement or a consortium agreement, permeated the interactions between human and non-human actors, such as metadata structures and software code. In digital cultural environments, commoning activities and cultural practices increasingly rely on digital platforms and social networking sites governed by often commercially motivated rules and laws that commoners are not able to negotiate or influence themselves. This obviously creates a dilemma when working to build sustainable cultural commons: one of the key design principles – that those who are affected by the rules should be able to participate in modifying them – is thus beyond what commoners can influence. This sometimes forces the actors in cultural commons to seek alternative measures, and sometimes means that their creative activities and boundary setting acts are in conflict with the terms of use or legislation. In the AvoinGLAM case, it became evident that organizations and commoners wished for shared and commonly drafted principles to loosely guide their activities, rather than fixed rules that set the terms of participation. Commoners also appreciated having a shared commoning language and practices, which they can use to align their current and future activities and to negotiate the internal as well as external (e.g. legal and commercial) pressures that work toward enclosure of cultural commons. As a result, the international OpenGLAM movement created a set of principles for institutions aiming for more openness and opening collections[44].

The challenge for a professional designer operating in a commons framework is to design ways of balancing between on the one side the official regulatory set of rules and on the other cultures-in-use, and to find ways for commoners to influence and/or take-part in processes and decision making that concern the commons. The cases and experiences discussed in this dissertation indicate that if, in the co-design of information infrastructures, we would like to move towards more flexible, open-ended and commons-like approaches, then we need to direct more design attention and infrastructuring activities towards negotiating the govern-

44 The OpenGLAM principles for cultural institutions can be accessed and reviewed here http://openglam.org/principles.

ance regimes and terms of participation with multiple actors that have an interest or stake in the commons. In addition, professional designers should reflect more on whether and how they impose their own values, politics, and attitudes through co-design and infrastructuring activities, as well as how these concerns are reflected in the design process, and in the becoming of an infrastructure. An important insight here is that an infrastructuring approach that works toward open cultural commons can thus not only build upon the of rules-in-use but must, if it is to be effective, be extended to encompass culture-in-use.

5.2.2 Price of participation?

Ordinary people participating in and contributing to cultural commons are often volunteers. In all of the three cases of this dissertation, people were participating in the co-design and other activities and events on a voluntary basis. Sometimes in the cases tensions arose when some people were participating and contributing to common good without any compensation, while others participated as part of their daily job, for example those employed by project partners or collaborating institutions, such as school teachers and museum staff. At times friction occurred, especially if the time invested by volunteers did not result in outcomes that would have met their expectations. Especially in the context of Fusion's co-design process, there was a notable imbalance between how generously the participants invested their time and effort and what concrete or intangible benefits or value they obtained from the process. Learning from these experiences, in EUscreen, the returned benefit for the invested time and creative input of practitioner volunteers was more carefully considered and a value exchange model was put in place (e.g. experts were teaching new skills to participants). In the context of AvoinGLAM, which was a self-driven open culture movement based on voluntary participation, the vantage point was different. One of the big challenges to solve here was how to balance the paid work (occurring both through the initiative's funded projects, and through participants' external day-job) and the so-called voluntary activist work, and determine collectively what kind of mechanisms to design and implement to ensure a fair and enduring movement. Most of the sustainable approaches that could be useful for infrastructural work done in digital cultural heritage movements and to foster culture commons are coming from the literature studying commons-based peer production (e.g. F/LOSS projects, Wikipedia community).

These modes of organizing production and creative actions have become mainstream among participation platforms already in the first decade of the 21st century (Benkler 2006, 2011).

To put it bluntly, the practice of engaging volunteers in the collaborative design of technologies, without a meaningful compensation mechanism, is highly problematic. On one hand, enabling and mediating access to computer technologies and their design to non-professionals challenges the social division of labor, as well as how and by whom technologies are designed (Söderberg 2008). In turn, critical voices arising both from practice and academia are questioning the application and widespread use of hackathons as a corporate way of harvesting free labor, ideas and innovation, and some criticize the very hackathon setting as a rehearsal of "an entrepreneurial citizenship" (Irani 2015). Without going into the politics or concept of labor here, I note, based my empirical work with the three design cases, that in infrastructural development there should be an emphasis on collectively negotiating and articulating the terms of participation and on explicitly addressing everyone's expectations. Another insight deriving from the AvoinGLAM case is that greater openness, for example open budgets and funding proposals, increases accountability and transparency, attracts more people and motivates them to contribute to the commons. Through working with the AvoinGLAM case I learnt that sometimes institutional structural changes, for example a same-salary principle for all competences and years of experience, is called for to ensure and communicate to commoners that all skills and efforts are equally appreciated and valued, and to prevent some of the social dilemmas related to labor and monetary compensations mechanisms. These insights and measures are very much in sync with the finding in Star and Ruhleder (1996) that infrastructures are routinely taken for granted, and that the infrastructural work and maintenance is also often invisible work, and often also undervalued (Star 1999).

5.2.2 Common language, shared narratives and articulation

When design activities are orientated towards co-constructing commons culture, articulation work and language issues should not be overlooked, an issue which became evident in all three cases. Blomley (2014) has argued that commons do not have to be governed through rules, but can be "a moral and political commons, justified and enacted through a *language* of rights and justice" (p. 318, my empha-

sis). Looking at the three cases, people's moral compass often seems to guide their commoning activities, and their approach to how to care for the shared resources. This concern and care include activities to circumvent or set aside rules and regulations for the sake of the maintaining healthy commons. In this way, the legal commoning question is also a political and moral question, namely, as was pinpointed in the way copyrights came to control a commoning activity in EUscreen: who has the right to our common culture and cultural heritage? This question cannot only be answered in the abstract or in academic discourse, but needs to be addressed in daily practice, including language practice that is an important part of a commons culture. Language is the key to constructing power relations and is thus important for achieving the non-hierarchical aims that are embedded in the idea of cultural commons. Values, morals and attitudes are communicated through rhetoric and are embedded in people's everyday practices.

In the context of the cases, the aim was, as in many PD projects, to construct a shared language and create a set of shared understandings precisely through a collectively defined vocabulary that was thought to be relevant for the movement. In Fusion, the toy-like design game employed in co-design sessions was devised to make new concepts familiar for the participating communities, find common concepts for media practices and routines, and articulate community language (e.g. informal sayings, slang, terms, concepts) to others outside of the community. Similarly, in EUscreen the participatory design techniques and tools applied were geared towards explicating and articulating e.g. institutional concepts in co-design workshops, or practitioners' media practices related to video remixing in a learning-by-doing workshop (see Marttila and Hyyppä 2014a). In turn, in AvoinGLAM, institutions and commoners had a need for guiding principles and definitions of key concepts, as well as for a shared commoning language and practices. They could apply such language and practices to align their current and future activities and use them to negotiate the internal as well as external (legal and commercial) pressures that work towards enclosure of the cultural commons they were constructing. Blomberg and Karasti (2013) note that the notion of 'articulation work' has informed CSCW research. They are building upon the work of Strauss (1985, 1988) in describing the concept as "…work that gets things back "on track" in the face of the unexpected, and modifies action to accommodate unanticipated contingencies" (Star and Strauss 1999, p. 10). Articulation work is important for infrastructures as they are always growing and not settled in relation to practices,

"…variations, deviations and inconsistencies must be resolved in the "here and now" through actions…" (Blomberg and Karasti 2013, p. 379). Nevertheless, shared principles and articulations have their limits and it is the emergence of a collectively shaped commons culture that determines if a commons and infrastructure supporting it will endure and be sustainable.

The space of digital culture and digital cultural heritage is contested and, as pointed out by Star (1999), "often one can locate a master narrative in such a space, a voice that speaks from the presumed center of things, and does not problematize the diversity of the issue" (p. 384). Similarly, Fuad-Luke, when describing 'design activism', sees that through creating counter-narratives design can challenge the present and create change (Fuad-Luke 2009). For AvoinGLAM, and its commons culture, it became important to create counter-narratives of "open culture" to challenge the hegemony of a "closed culture" master narrative that was present at the time in Finnish society, to put it in simple terms. Depending on its assumed position in a cultural environment, the AvoinGLAM narrative could be seen to speak from a 'center' conforming a master narrative that others in the movement would challenge. Thus, power struggles, domination and hierarchies, often based on social or cultural capital, are unavoidable (cf. Bourdieu 1983). To support and strengthen a commons culture in the AvoinGLAM movement, stories were produced and circulated, e.g. about the history of the movement, about the opening-up of previously closed collections and work practices. In addition, communicating and producing knowledge became paramount when shaping and supporting the commons culture, as well as co-designing formats and practices for documenting and sharing knowledge for future uses (e.g. guidelines, handbooks, DIY tutorials). These culture-sharing activities aimed to lower the threshold to join the social movement, and to enable more open, democratic and distributed (and not centrally organized and governed) participation, nationally in Finland and internationally through and with the OpenGLAM movement. An essential part of the commons culture is evidently the practices deriving from different institutions, communities and practitioners. Shaping and adapting new practices or a culture can be highly demanding for the people doing it. In order to participate in the co-construction of the cultural commons and benefit from the common-pool resources, I found in all cases that some people from established cultural institutions had to quickly adopt an entirely new working culture and new technological tools, e.g. to be able to take part in synchronous collaborative writing over a distributed

cloud-server. At the same time, participants from institutional backgrounds had to convince their organizations that an attitude of openness could benefit their work and institutions. Hence, how the different parties are able to respond to and go beyond the challenges that various or clashing cultures impose on participating in collaboration becomes a crucial task *also* for a designer aiming at infrastructuring a balanced and sustainable cultural commons.

5.3 Initial design principles for commons design

The key contribution of this dissertation is the above identification and explication of infrastructuring strategies for cultural commons. These strategies are developed in dialogue with co-design practice and research literature stemming from infrastructural studies and commons research. In this concluding section I draw on these strategies and the theory behind them to explore and reflect on: What is required from a designer and design researcher that is engaged in the co-construction of commons?

To answer the question about what is required to design balanced cultural commons, I propose and discuss *commons design* as a design orientation and attitude that aims for contributing to a sustainable and enduring commons[45]. The notion was briefly introduced in Article 4, and collaboratively probed in a design research workshop at the Design Research Conference (DRS) 2014 (Marttila et al. 2014b), but is not yet well described. In the article we ask "What could we as professional designers and researchers, who operate in commons-like frameworks and aim to support collective action, learn from the commons research?", and how can findings from this body of knowledge connect to PD practices and research? In addition, we question whether we as professional designers are ready to reconsider our designer role when operating in commons, and see ourselves as co-constructing

45 Similarly, some scholars have combined the concept of publics and a design of a digital commons to develop a framework for "public design" that refers to the "development of digital commons through the articulation of matters of concerns" (Teli et al. 2015, p. 19). Here, the design orientation is kindred with my contribution of *commons design and commons culture.*

and co-designing commons with other commoners? (Marttila et al. 2014). If we are, then what could the new practices, strategies and principles for commons design be, and what is our position in the current digitally networked society? What would a new paradigm of design be like, where people construct commons every day and everywhere in varying contexts? What perspectives and actions need to be brought to the development of new design research agendas that consider commons both as a context, as an objective and as an object of design? And furthermore, what could be considered design principles and strategies for sustainable and enduring commons design? Before addressing these questions, I will revisit some of the scholarly work on "design principles" within the commons research tradition.

Elinor Ostrom made 86 case studies of small or medium scale natural recourse commons from various sectors (e.g. agricultural production systems, forestry and fishery), and identified eight "design principles"[46] for long-enduring and robust commons. These include: "Clearly defined boundaries; Congruence between appropriation and provision rules and local conditions; Collective-choice arrangements; Monitoring; Graduated sanctions; Conflict-resolution mechanisms; Minimal recognition of right to organize; and Nested enterprises" (for common-pool resources (CPR) that are part of a larger entity) (Ostrom 1990). These principles apply to local arrangements of CPR that grow over time through collectively refined governance and rules systems. Scholars have examined the applicability of Ostrom's design principles to global resources and emerging technologies, and have largely concluded that they do not apply as is, and that additional principles are warranted (see e.g. Cox et al. 2010, Stern 2011 and Diez et al. 2003). An abundance of studies on open digital commons, such as Wikipedia, Linux and other commons-based and open modes of production, have aimed to trace these characteristics and principles (see e.g. West and O'Mahony 2008, Balka 2011, Benkler 2006, Bauwens 2009). However, rarely have designers probed these principles and

46 By "design principles" Ostrom referred to "an essential element or condition that helps to account for the success of these institutions in sustaining CPRs and gaining the compliance of generations after generations of appropriations to the rules in use" (Ostrom 1990, 90). Later Ostrom clarifies, that the aim was specifically to identify a set of features that could be expressed in a general rule format to study already existing systems, not proposing them for the design of new ones, as the term 'design principle' was misunderstood by some people (Ostrom 2012, 77).

aimed to develop complimentary ones. (For some explorations, see Marttila et al. 2013, Article 4: Marttila et al. 2014, Seravalli 2015).

In the following, I trace some of the insights and initial principles I have found important in my journey of supporting and enabling opening and pooling common cultural heritage, creating wider public access and appropriation of common digital cultural resources and ultimately constructing and contributing to cultural commons. Drawing on the three design cases, I explore how some of the central issues can be articulated to guide a future design research agenda as well as guide the practices of professional designers aiming to work in commons settings. As I have explored the commons literature already in Chapter 3 and in Article 4, and shed light on its contributes to PD, in the following I will therefore focus on a personal account and reflection on the role of a designer in the context of infrastructural development for commons.

a) From empowering participation to open-ended co-design and commoning

My work with commoners in digital cultural heritage projects has led me to conclude that as professional co-designers we need a reorientation. We should dare to go beyond 'empowering' people and structuring participation through time-limited projects, and enable participation without a pre-defined framework or predetermined outcomes. We should move towards democratic and non-hierarchical collaboration and collective action, learning together how to equip and support each other to build and maintain the commons.

In Participatory Design (PD) endeavors, stakeholder participation has been a political strategy and vehicle for increasing the democratic qualities of design, and of society. Facilitating, extending and empowering the participation, design space, and artefacts of collaborative design has been a quest for many contemporary design research scholars (see Chapter 2). If we follow the proposition to see publicly provisioned cultural heritage as open and public commons, and acknowledge that people increasingly construct commons around digital culture and practices connected to it, we need novel design methods and approaches to engage people to be commoners. An integral part of such work is to engage commoners in infrastructuring for cultural commons and the infrastructures they rely on. It means allowing people freedom to contribute autonomously without being controlled by a

predefined framework, for example a project or design process planned by designers, and this requires us designers to shift our mindset. It means that as designers we need to share the authority and authorship of the design process and its possible outcomes, and relinquish our central role in and control over the process. Reorientation towards commons design requires flexibility and willingness to share authority, power and decision-making, and develop mechanisms of self-governance, to and with fellow commoners. This is not to say that professional designers and their expertise are no longer needed. Rather it is to convey that in commons-based frameworks, designers can contribute to commons, as any other commoners, from their unique personal and professional skill-set. Shifting from merely facilitating participation to supporting commoning requires the co-creation of a commons culture, since a commons is best governed and managed through social relationships and practices which are – as I have discussed in this dissertation – subject to dilemmas and moral conflicts between and among commoners and between these and other actors. A challenge for a professional designer, and for others operating in commons, is to deal with a new set of design challenges and qualities such as fairness, trust, and intrinsic and social motivations.

b) Commitment to structural openness

Operating towards infrastructuring cultural commons, I found that openness[47] is one of the key qualities. This has many aspects, e.g. access and use rights to the design documents and tools, other common-pool materials, license frameworks and software modules, as well as more conceptual and implicit aspects such as the attitudes of people participating in making commons. Openness through actions and conscious choices for openness on the infrastructural levels enables and encourages openness towards common-pool resources and among commoners. Thus, mediating openness in multiple dimensions in commons requires a multidiscipli-

47 Openness is a slippery term that escapes definitions. Here, I consider openness in various layers of infrastructural work and construction of commons that can affect the infrastructuring and commoning activities. In the context of open cultural data and materials I lean on the collaboratively drafted definition maintained by Open Knowledge, and in addition I build upon the notion of 'open design' (understood as open design resources and their appropriation) and open-ended design, a mode in which the design outcomes are not settled and are negotiable by its participants.

nary effort from people with mutual interest. This could include the ability to access and edit shared documents in-the-making on a cloud server, or the use of free and/or non-proprietary digital tools and software, or enforcing transparency of finances and decision-making processes' to enable stakeholders to take part. In the case of AvoinGLAM, for example, all its externally funded projects were using the online Holvi banking system, which allows budgets and transactions to be publicly viewable in real-time. Likewise, all funding applications were written on publicly available, shared and editable online Etherpads[48]. Commoners, if they wished to, had a possibility to monitor and influence how funds were to be used and for which activities to apply for funding.

Structural openness is not a magic bullet; it can create tensions and fractions between the commoners. In the Open Knowledge Finland association that AvoinGLAM is connected to, different initiatives are competing for the same external funding sources, and they can follow each other's open planning and proposal writing. The association's decision-making bodies refrained from shortlisting or endorsing any specific funding applications, resulting in that external funding bodies evaluated many proposals from the same organization. Despite the value of openness in co-constructing commons, it is good to keep in mind that sometimes 'openness' can be very superficial and be applied as a marketing talk to attract certain user groups or to secure funding from public bodies. Open-washing (similar to green-washing) or being open only on the surface could include e.g. releasing software as open source, however it is not findable or usable because it is for example ill-documented for others, or, is excluding certain groups of endeavors (for example excluding commercial use via certain license selection) from benefiting from shared resources.

c) Sustained attention to regulatory frameworks and social justice

Designers need to pay sustained attention to copyrights, intellectual property and privacy issues; to respect them but at the same time critically approach the notions of rights and property. Questions related to ownership, property and rights

48 It should be noted that not all web-based systems AvoinGLAM used were "open", as discussed earlier in the dissertation most of the online activities were taking place on Facebook and through Google products (e.g. calendar, documents, spreadsheets). This was for practical reasons and by choice of the members of the community.

are crucial in cultural commons, and they affect both infrastructural development as well as the becoming of commons. As discussed earlier, if we choose to view our cultural heritage as commons, we abandon or disregard understanding digital cultural heritage as property or commodity. Copyrights define the rights to a piece of cultural work as stated in the law, yet practitioners and communities of practice can have other social agreements and understandings of ownership of collectively created cultural materials. These alternative modes of ownership should be acknowledged and addressed by designers. Enforcing conflicting rule schemas by social or technology design can be damaging for commons and infrastructural development, and might lead to abandonment of infrastructures and commons.

In addition, as I have discussed through the cases, in the cultural commons frame the notion of 'rights' is wider than the use rights and copyrights. In the context of cultural heritage, rights can also stem from a sense of belonging to a specific culture and its rituals and traditions, and include moral justification for appropriation. Research and scholarly work on 'cultural appropriation' in the context of humanities and cultural studies, (see e.g. Rogers 2006 for a literature review), denotes individuals' or groups' rights to their own culture. People from the 'outside' who – without first-hand knowledge or experience of the culture – make use of and appropriate cultural materials, are likely to be disapproved of. For these reasons, it is important that professional designers are attuned to not only legal and regulatory frameworks, but also to the social and moral dimensions of heritage and to commoners' perspectives on heritage. As was shown both in the Fusion and EUscreen cases, technology allows non-subtractable resources (not limited, non-rivalrous) to become subtractable through imposing intellectual property schema to cultural materials. In Fusion, a Creative Commons license selection was made a mandatory feature when uploading media. In EUscreen the audiovisual collection on the portal was released under all rights reserved and downloads of material was hindered through the software design. While open license frameworks such as Creative Commons (CC) offer rights holders flexible ways to permit certain rights to their holdings, some institutions have, however, "misused" both the spirit of the license and copyrights and have without appropriate authority, through technology, marked cultural heritage already in public domain as licensed with a CC license (see Article 3: Marttila and Hyyppä 2014a). If we treat our cultural heritage *only* as commodity governed by technology or legal regimes, we support the enclosure of cultural commons.

d) Knowledge production for societal benefit

Politics is not a separate layer or issue of infrastructure, rather it is, or should be, fundamentally embedded in the infrastructural work. In Chapter 4 I argued for bringing policy work 'in' as a part of the knowledge production of Research through Design approach. Designers of information infrastructures aiming at contributing to commons are entangled in a maze of politics, policies, legislative, social and cultural issues. In order for an infrastructure to develop and grow, in addition to the technology development and evolving social practices, it requires political work in the form of negotiating policies and agreements. For the core democratic concerns of PD to feed into the policy and decision-making and amplify the voices of those who cannot be vocal themselves or those who are not given the opportunity to be vocal, more advocacy is required by designers and design researchers. As design researchers, we can bring complementary professional views into regulatory planning, views that do not stem from commercial concerns and guard against ever-present risks of enclosure and commodification of our common culture and cultural heritage. (Some PD work aiming in this directions is already evident, see e.g. Bødker et al. 2017).

The foundations of Scandinavian PD lie in its political commitment to foster democracy, and "empower" people to shape the technologies for their use and benefit, doing so in alliance with other relevant stakeholders, laywoman and experts alike (Ehn and Kyng 1987, Greenbaum and Kyng 1991, Shapiro 2005). Perhaps, though, people are already empowered – for example in the case of commoners? And when they start to collaborate with design researchers and official institutions they, in that constellation, sometimes lose control or their agency might be compromised. They could even be disempowered due to institutional and research politics. To ensure that design sustains and supports their own emancipation rather than alienate and disempower, PD as a community could develop strategies rather than solutions, suggestions for others to use, change and develop. Healthy commons can be encouraged, not imposed, and depend above all on commoners.

The Finnish Museum of Photography / Fred Runeberg

6. Conclusions

This final chapter summarizes the key findings and contributions of my doctoral dissertation. In addition to collecting the empirically grounded findings and proposals from individual research articles, I hope to contribute both practical implications for the professional practice of Participatory Design, and to bring forward some theoretical considerations relevant to contemporary design research.

In this dissertation I have proposed to conceive of publicly provisioned digital cultural heritage as cultural commons. In Europe, the European Commission's policy-driven framing of digital cultural heritage through the notion of 'memory institution' has been the institutionally favored approach to fund and structure cultural heritage research and design activities. Two of my cases, Fusion and EUscreen, are part of the implementation of this policy. However, I argue that this approach, at least as currently implemented, is insufficient for digital cultural heritage as it overlooks the need for more democratic, symmetric and open-ended cultural heritage and history making practices, often in favor of more certain and predictable project outcomes. Furthermore, I argue that this policy agenda has difficulties in allowing polyphony instead of only institutional, authorized and canonized voices (see Chapter 3).

Art and cultural institutions have traditionally been gatekeepers of both access to and designation of cultural materials, and have through official procedures and policies safeguarded and preserved selected common cultural materials for future generations. These institutions are increasingly inviting their audiences and visitors to be part of their collection, enrichment and exposition practices, as well as to engage and interact with their digital holdings. That said, only a small fraction of digitized holdings in Europe has so far been released in ways that

both legally and technologically make them accessible to and re-usable by the wider public.

In addition, conditions for collaboration between different parties in the digital cultural heritage field remain asymmetrical and power relations between institutions and citizens are uneven and unjust. More often than not, it is the cultural institutions that frame, decide on and limit the ways of participating and engaging with digital cultural heritage materials, e.g. through crowdsourcing, competitions or events, and in this way dictate the rules of participation. If we were to view digital cultural heritage resources as socially arranged and managed common pool-resources and/or as cultural commons, we should strive not to restrain when and how people could engage with their culture. This freedom for citizens to designate, access and appropriate digital cultural materials could lead to more symmetric and democratic practices of memory, culture and history-making. It could affect what is considered cultural heritage, who has the right to use and interpret it, and perhaps create a more balanced distribution of power between different parties and, in so doing, help the emergence of creativity.

As a key contribution of my doctoral research, I have developed a theoretical framework that combines scholarship on information infrastructures and commons. Through bringing these research perspectives together and developing selected specific concepts from them – mainly the concepts of common-pool resources, gateway and installed base – I have formed an analytic frame for discussing the collaborative infrastructural work undertaken in my three design research case studies. This framework was applied (in Chapter 5) to address the tensions and dynamics of infrastructural development and infrastructural change for digital cultural heritage.

Latching on to the conceptualization of design as infrastructur*ing,* inspired from the STS research tradition and especially articulated in contemporary PD (Karasti and Syrjänen 2004, Karasti and Baker 2004, Ehn 2008, Björgvinsson 2010, 2012a), I proposed four infrastructuring strategies that could contribute to longevity, sustainability and robustness of cultural commons. These four strategies are 1) probing and building upon the installed base, 2) stimulating and simulating design and use through gateways and in-between infrastructures, 3) producing common-pool resources, and 4) fostering and shaping a commons culture that supports commoning.

Each of these infrastructuring strategies were implemented to reach across the gap between, on the one hand, the institutional digital cultural heritage col-

lections and the technology systems used to manage and maintain them, and, on the other hand, the platforms through which people use, create and share digital cultural works. Engaging with these infrastructuring strategies was a useful way to identify and review in depth the layers and characteristics of existing infrastructures, and to unfold how they are brought into being and put into use. Active probing and understanding of an infrastructure's installed base(s) can be useful in the design and development process, can be helpful for better identifying infrastructural challenges, and can assist in finding and confirming an orientation to design activities. Creating common-pool and shared resources is a prerequisite for establishing a commons. An infrastructuring strategy for collectively producing and pooling shared resources, both cultural materials and knowledge reservoirs, on the one hand aids the commitment to local commons and the group governing and maintaining it. On the other hand, it helps build robustness and sustainability of a global open commons. Applying the notion of gateway in a metaphorical sense and as a practical strategy helps to identify incompatible socio-material-technical infrastructures and practices, as well as design workarounds and ad-hoc arrangements. It aids to construct experiments necessary to bridge gaps in infrastructures and to stimulate and simulate these new configurations and arrangements. These gateway explorations have a specific role in enhancing technologies and practices, they help infrastructure to evolve and grow, and connect to other systems, networks and resources. Further, in these staged experiments and workarounds, stakeholders have a possibility to collaboratively create common ground, rehearse emerging practices, and build and pool shared resources.

In infrastructuring for cultural commons, I argue for taking culture as a unit of design. This is daring, nevertheless I argue that it is a necessary move in infrastructural development for cultural commons. The continuous co-construction of commons culture fundamentally affects the governance and provision of both local and open commons, and influences how commons are, or are not, cared for. (See e.g. Light and Akama (2014) account on politics of participation, social relations and care). Even if these infrastructuring strategies were developed and applied in context of digital culture and cultural heritage, I hope and believe that other designers and design researchers operating in commons-like frameworks will find them useful.

In generalizing from the analysis of the cases and the theory underpinning this

analysis to a set of broader infrastructuring strategies, I have charted, in the concept of 'commons design', a set of principles that can be useful for advancing Participatory Design and can inform future initiatives aiming at designing for commons, and working across commons-like frameworks.

Drawing from the practical design work conducted in the three design research cases, and by connecting commons literature and research on information infrastructure, I have explored how some of the central issues of PD can be reconsidered to guide a future design research agenda as well as guide the practices of professional digital media designers operating in commons settings. I have structured the discussion and requirements as initial principles for "commons design". These principles include: a) From empowering participation to open-ended co-design and commoning, b) Commitment to structural openness, c) Sustained attention to regulatory frameworks and social justice, and d) Knowledge production for societal benefit.

In this doctoral work I have also suggested that professional designers in Participatory Design and related fields, who are engaged with initiatives of collective action, community driven endeavors, peer-to-peer and commons-based creativity ,could turn to and learn from the scholarly work on commons. Valuable insights can be developed by engaging with traditional commons research (e.g. the school of thought following Elinor Ostrom's path-breaking work), open-commons research, and activist-practitioner experiences of operating in and working with the making-of commons (see Chapter 2). This rich multidisciplinary body of knowledge offers both knowledge on locally and socially managed, maintained and provisioned common-pool resources, as well as publicly provisioned global open-for-all resources. I have argued here that for constructing cultural commons, viewpoints from both the local and open-for-all commons arrangements are pivotal. Often assigning and pooling digital cultural heritage for commons is local work that requires localized specific knowledge and skills, and the engagement of various stakeholders. Due to the digital convergence and the logics of the Internet, however, in theory, when open access principles are followed, the very nature of digital collections are within reach of anyone with an internet connection and the devices to make use of it. In order to enable access in practice to digital cultural heritage and other digital cultural resources, understanding the characteristics of large-scale open commons, its parameters and constraints, necessarily comes into play. I assert that for arranging initiatives for digital culture and digital cultural heritage, both types of commons arrangements can provide useful recommenda-

tions and insights, as they serve different audiences, but require different design strategies and approaches for their development and sustainable maintenance.

As called for by Kyng (2010) and Dourish (2010), there is a need for designers of IT and ICT to be more involved in the political matters and "design in politics" (Dourish 2010). Similarly, Bratteteig and Wagner (2014) speculate that politics is an overlooked issue in PD, and Teli (2016) advocates bringing politics back in PD. In this doctoral dissertation, I have endorsed these ideals. My doctoral work as an activist academic and PD practitioner has been politically charged, and my views and values have increasingly directed my professional practice. As my research progressed, open culture advocacy and policy work became an integral part of my design research activities, and I put a substantial effort into advocacy and policy work (see e.g. Marttila and Sillanpää 2014, 2015). In Chapter 3 I argue that designers of technology systems and information infrastructures should pay more sustained attention to and place emphasis on producing knowledge that can underpin policy work through their design activities in addition to producing scientific contributions to academia and design contributions to the public (cf. Ehn 2008, Binder et al. 2011). More designer advocacy could feed into policy and decision making in order to both amplify the voices of those who cannot be vocal themselves, and to bring different professional views into politics and policy work. It is my view that as a designer, due to the nature of design, I cannot choose whether to engage in politics or not, as design is always already political. What I can choose is to be aware of this and thus be able choose how to bring my values and politics to design research. In this dissertation, I have argued that being open and reflective about one's political agenda and network increases the designer's accountability, and facilitates the validation and evaluation of design research contributions. My personal commitment, both in my personal and professional capacity, to advance open and/or public access and appropriation of digital cultural heritage materials, has inherently influenced the design of information infrastructures and construction of commons that I have been engaged in.

The three design research cases that underpin this doctoral dissertation – Fusion, EUscreen and AvoinGLAM – have confirmed that there is great potential in fostering a productive and collaborative relationship between, on one hand, institutional cultural heritage initiatives, and, on the other hand, amateur and peer-to-peer online media practices and infrastructures. Learning from the cases, I argue that initiatives that aim to support the revitalization of cultural heritage through

digitization should focus more on the collaborative dimensions that their systems and infrastructures rely on and reconfigure. My findings and experiences suggest that digital cultural heritage infrastructures can become catalysts in the construction of shared cultural resources that enable and encourage collaboration between diverse audiences. Collaborative infrastructuring can lead to relational processes of engagement with digital cultural heritage, and enable negotiations and articulations over what is considered beneficial in a given context and for whom. If digital cultural heritage initiatives, in established institutions as well as in everyday cultural production, take the collaborative dimensions of infrastructuring more seriously into consideration, then the likelihood of nurturing sustainable cultural commons increases. I hope my doctoral dissertation is a contribution to that direction.

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Appendix 1. Original research articles

I.

"Co-Design of a Software Toolkit for Media Practices: P2P-Fusion Case Study" in *New Media Technologies and User Empowerment*. Jo Pierson, Enid Mante-Meijer and Eugène Loos (eds.) © 2011 Peter Lang. Reprinted with permission.

Sanna Marttila, Kati Hyyppä and Kari-Hans Kommonen

Co-Design of a Software Toolkit for Media Practices: P2P-Fusion Case Study

Introduction

In this chapter, we will explore several aspects of user empowerment through a case from a project called P2P-Fusion, in which an open source software toolkit and media applications were collaboratively designed together with communities of everyday people. By analyzing the lessons learned from this case, we aim to shed light on the following issues: What benefits and challenges are there in empowering and engaging everyday people in the co-design of a software toolkit? What kinds of strategies, methods and work practices are needed to facilitate this kind of co-design process?

The case presents several aspects that are relevant when discussing the empowerment of people: first, the intentions and motivations behind the project; second, the process and activities within it; third, the constraints of the project's context as a EU co-funded R&D project, and the obstacles encountered with the available technology; and finally, fourth, the results and outcomes of the project. We will touch upon these aspects throughout the chapter.

Open source projects have a long history in engaging a distributed community of software developers and end-users into a collaborative design and development process with a number of established tools, methods and work practices (Raymond 1999; Von Hippel 2001; Tuomi 2002). However, end-users without technological expertise or knowledge of specific coding languages or programming skills have had rather limited opportunities to take part in these projects. In recent years, emerging social media platforms, applications and a large number of Web 2.0 tools on the internet have made it possible for everyday people to participate in cumulative peer-production of knowledge (e.g., Wikipedia), creation of content (e.g., YouTube), enrichment of meaning and even the construction of custom, individualized applications (e.g., Facebook). While this development has created a tremendous opportunity for anyone with internet access to take part in creative content production with global distribution, it offers users rather limited possibilities for innovation in designing the actual social media systems on which this revolution is based.

One way to facilitate participation of everyday people in the creation of future technologies is to use design methods that include peoples' point of view in the design. User-centred design methods have become common in the development of interactive technology systems, devices and services in the field of information and communication technologies (ICTs) (ISO/IEC 13407 1999). Moreover, getting everyday people involved in design processes has become a recommended strategy in digital design (Sanders & Stappers 2008). Approaches

such as participatory design (PD) and co-design provide means to engage people in collaborative design of technologies and systems they use (Schuler & Namioka 1993; Muller 2002). The level of engagement in such approaches has varied from users informing and inspiring design to user-driven innovation (Haddon et al. 2005).

Our work builds upon the tradition of participatory design that recognizes potential future "users" that are not trained in design as active co-creators and partners for the duration of a design process (Sanders 2002; Sanders and Stappers 2008). Furthermore, co-design, which we consider both as an approach and set of principles as well as activities carried out in a design process (Botero & Kommonen 2009), forms the theoretical as well as practical core in the software design case presented in this chapter. Appropriating Sander's vocabulary from her mapping of design practice and design research, the project's design process was "design-led" with "participatory mindset" applying "thinking tools" for understanding people's wishes, needs and current media practices (Sanders 2008).

Engagement of people in the design of the technologies that they use can be also facilitated by providing flexible systems and services, such as customizable applications and software toolkits, which can be tailored and developed further by their users. Fischer describes this *Meta-Design* (Fischer & Scharff 2000; Fischer 2003) as a type of design that "characterizes objectives, techniques, and processes for creating new media and environments that allow "owners of problems" (or end-users) to act as designers" (Fischer 2003). Fischer focuses mainly on end-user developers (EUDs) whose "activities range from customization to component configuration and programming" (Fischer 2003). As the Fusion software system was developed with several types of users in mind and with different levels of expertise, we use the term "end-users" to refer to people who are potential or future users of the system or its parts developed in the project. Our concept of end-users includes not only developers, but also people who may not have any programming expertise.

The concept of Meta-Design is important for the creation of environments that empower users. From a designer's point of view, the challenge of Meta-Design is to design for designability: how to design something that is not only a final product to be "used", but also becomes a resource that is available and presents a potential for designing. While Fischer talks about people as "owners of problems", we extend his approach in the case presented in this chapter, and focus on everyday people as designers by being "owners of their practices". The notion of practice is incorporated into our design philosophy; we aim to understand people's practices and translate them into software toolkit design.

The chapter is organized as follows: Section 2 introduces the project and describes the chosen design philosophy and approach. Section 3 reports the case study and demonstrates the practical work carried out. Sections 4 and 5 discuss the findings and lessons learned, evaluating the outcomes of the case and identifying strategies of empowerment, while Section 6 summarizes the

conclusions.

Introduction the case: P2P-Fusion

The work described in this chapter was conducted in the context of P2P-Fusion, which was a three-year research and development project (2006-2009). The project's aim was to create a novel peer-to-peer platform called *Fusion* for creating audiovisual social media applications (Figure 1, left). The Fusion system binds together a peer-to-peer network, a distributed metadata layer, social processing and enrichment features, support for embedded licenses, and a component-based toolkit called *Social Media Application ToolKit (SMAK)*. Specific, practical goals for the system were to support social activities that include the creative use and reuse of audiovisual content, and to provide a software toolkit with re-usable components. The aim was that people could use the media applications implemented with the SMAK to share, edit and enrich videos collaboratively (Figure 1, right). With the toolkit capabilities, the applications could also be tailored, and new applications be built to support particular media practices.

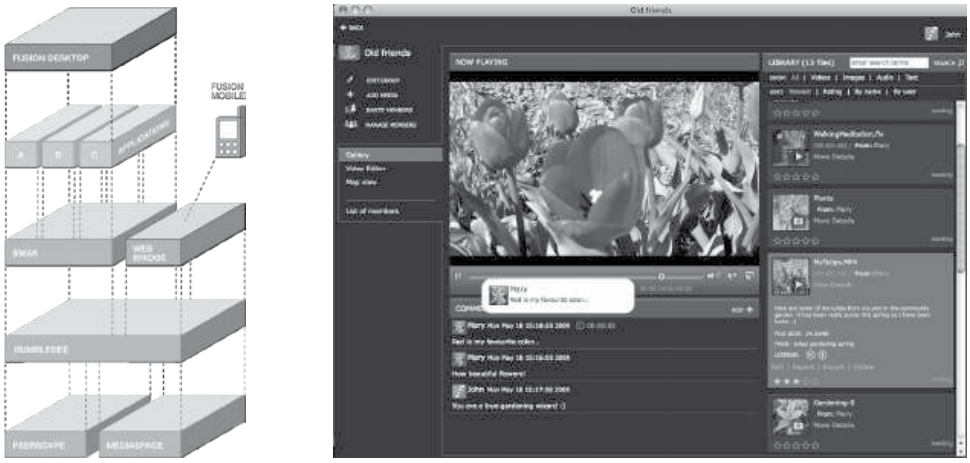

Figure 1: An illustration of the Fusion software architecture (left) and a screen shot of one media application prototype built with SMAK components (right).

The P2P-Fusion project included a variety of large-scale research and development activities with several stakeholders (e.g., research institutions and audiovisual archives). In this chapter, we discuss the research and co-design activities in the early phases of the SMAK toolkit design carried out by University of Art and Design Helsinki (TAIK) in Finland during the first two years of the project. A core aim of the SMAK software design was to develop tools for constructing desktop social media applications that can be tailored for specific media practices of different user communities. It should be noted,

however, that other software design and development activities took place in parallel to the activities described in this chapter (e.g., mobile client development; see Visanen & Rista 2009). The lower layers in the software architecture (e.g., *Mediaspace* and *Peerscape*) were designed at the same time, but this was accomplished through a more traditional software design process by computer scientists, with end-user application development and easy system management in mind.

From understanding practices to toolkit design

The study of people's practices has been of a longstanding interest in various fields of research (e.g., social science, cultural studies, philosophy), and has also been adopted in the field of design and design research (see, e.g., Botero et al. 2002). A practice is commonly seen as patterns of behaviour that include several units of activities which are interconnected to each other. Social practices are embodied and materially mediated arrangements of human activities that describe a particular way of going about an activity with its associated resources (Reckwitz 2002). Traditional software development and human–computer interaction (HCI) analysis usually focus on users' functions and execution of individual tasks. However, when the focus of attention is on the everyday practices of people, "practices" are taken as units of analysis instead of "problems" or "user needs". When translating practices into design language (e.g., description or illustration), a practice is manifested in a certain pattern or workflow that involves certain actors, employs a set of tools and relies on certain resources. Our particular aim, in the context of a toolkit design, is to identify the patterns and elements of the practices, and map them into the larger ecosystem of digital tools, systems and services (see, e.g., Botero et al. 2008).

In the project, this practice-oriented approach was essential, as it was envisioned that the Fusion platform would continue its evolution after the project's duration in the practices and development efforts of its user community, and could be connected with other software modules, libraries and APIs. Compared with many other R&D projects that aim to create technology or products for business, this project was designed from the beginning with the intention that it should lead to end-user empowerment in various ways, such as giving access to resources (i.e., Fusion software) from code level to ready-made applications; connecting communities with joint interests in international co-design workshops; and, through making the communities' practices visible through design tasks, enabling communities to identify and recognize their skills, strengths and potentials better.

The project's outcomes were to be licensed as open source software, so that anyone could have access to the code in all levels of the software architecture. However, as the modification of open source software requires software design and programming expertise, competences that are not easily

available to most people, we felt that Fusion should go further than that and aim to be adaptable, extensible and designable by the end-users. To this end, the Fusion platform design included the Social Media Application ToolKit (SMAK) that was designated as the topmost layer of Fusion, and would contain a set of components for constructing applications. The aim was to design the software components in such a way that they would make sense to people from the point of view of their practices, and to make it in this way possible for them to enter the design environment and act as "everyday designers" (Wakkary & Maestri 2008). Thus, they could bring the inherent knowledge of their practices into the co-design process.

Co-design approach in P2P-Fusion

Designers of technology systems and tools are not generally able to alone foresee the great variety of interests and potential practices and understand the motivations of people. Furthermore, even when people act as designers in their everyday life, end-users themselves cannot easily foresee all the possibilities of how the tools can be applied or how some modifications in the software tools can open up possibilities for completely new practices. By bringing the designers of software tools and the "owners of practices" together, helping them to see one another as designers with different sets of skills and interests but with a potential mutual benefit ahead, they may be able to enter a more fruitful design dialogue, that may, as a result, create better tools and interesting new practices. This strategy created the foundation for the co-design activities in P2P-Fusion. The aim was to actively engage people as experts and owners of their practices in the design process. Therefore, our collaborative design activities took mainly the form of workshops, in which interaction designers and software developers collaborated with communities that have practices in using and sharing audiovisual media (rather than using, e.g., applied ethnographic methods).

The name *Content Community* was used in the project for the communities that participated as co-design partners in the project, bringing their practices to inform the design. The Content Communities can be characterized as communities of people that share activities together in a common environment or space, and have social and mediated interactions in multiple ways. We adapt and adjust Lave and Wenger's concept of "Communities of Practice" and deploy it as an approach in relation to communities' activities (Lave & Wenger 1991; Wenger 1998). In the context of P2P-Fusion, audiovisual content or content creation was the common denominator for the communities (hence Content Communities). We collaborated with different types of communities, as we hoped to obtain a broader view of media practices this way. We considered this essential, as the project was developing a toolkit that could be applied for a variety of activities.

The following goals of the software strategy set the objectives for the co-

design process: 1) to explore Content Communities' needs, social practices and media use, and to re-use and translate these findings into design language (i.e., specifications, descriptions and technology solutions); 2) to support easy development of customizable applications with a component-based platform; and 3) to test the feasibility of the applications with representatives of the Content Communities. The ultimate design objective of the co-design process was to produce design descriptions for toolkit components that would form feasible Fusion designs based on the identified community's media practices. In addition, the Fusion design process was planned so that the software design and co-design efforts were feeding each other in dialogical process; the software development team obtained input from Content Communities for producing early prototypes of media applications which were built with a reusable software toolkit or building blocks (that were called SMAK software components), and Content Communities received the prototypes for use in evaluating designs and developing their own future applications.

The co-design process had three main phases: 1) initiating the co-design process, 2) co-designing activities and 3) exploring and testing the Fusion software. The co-design activities were continuous, programmed interactions (e.g., interviews, design tasks, workshops) that aimed to integrate the communities into the design process and enable forming of a design partnership between different parties in the project. In the following section, we will present and describe the first two phases in detail.

Co-designing the Fusion system and the reusable software toolkit components (SMAK)

Foundations for the co-design work were established in the first phase of the P2P-Fusion project. This included creating a shared co-design framework as well as finding new co-design partners, the Content Communities, that would participate in the design of the Fusion system based on their media practices, and possibly use and develop the software later. The partners in the project consortium came from multiple organizations and disciplines (e.g., software development, interaction design, archival institutions, legal and social sciences), and not all were familiar with co-design or similar approaches. Collaborative effort was therefore made to involve all the project partners in the co-design work. Ideas and expectations concerning the project, the Fusion system and its applications were collected in workshops. This facilitated creating a co-design plan and a development roadmap for Fusion, as well as recruiting Content Communities.

Recruitment of the Content Communities for the co-design activities started by mapping altogether 33 communities in Finland, Hungary and the Netherlands, some based on the project team's personal contacts. The communities ranged from amateur filmmakers and media educators to groups

centred on skateboarding, music and family activities. Based on the mapping and pre-set criteria, a few communities per country were selected and invited to meetings in which the project was introduced and the community members were interviewed about their media use and interests regarding the project. In the following, we briefly introduce the Content Communities with which we mainly collaborated in Finland.

● A music makers' community
The community is an online music community, which supports music and band-driven activities, focusing on developing the real-world activities (concerts, promotion). They have a web portal that provides a common space to communicate and promote the activities of the bands, which are members of the community. The community supports open licensing (e.g., Creative Commons) and promotes remix-culture.

● Extended family
The extended family consists of geographically separated members and small groups who share their life events with each other using technologies such as blogs and photo sharing services to keep the family connected. The community was particularly interested in sharing and creative reuse of video, as they did not have a practical way to do this. Video clips shot with a digital camera of family members and events were usually stored on a CD and shared face-to-face.

● Community organizing activities for children and youth
The volunteer-based community consists of local groups in different parts of Finland, which organize activities for children and youth including singing, drama, play and performances. The community has various types of media content ranging from the instructors' learning materials to documentary photos and videos captured by the children's parents. Finding new tools for archiving and sharing media files within the community was relevant for the community.

● Two sports enthusiast groups
Common activities of the groups, comprised of acrobatics and parkour enthusiasts, include training and organizing events together. Learning moves and tricks are at the core of both communities' interests, which includes sharing of one's skills and obtaining feedback from others - videos can also be used for these. Although these communities were already using servers and available online video sharing services for sharing audiovisual content, they were interested in having a tool that would enable private sharing of photos and videos, including collaborative enrichment of their metadata. Some members were also interested in editing and remixing videos.

Co-design with the content communities

In the second phase of the project, close collaboration with the Finnish project team and the Content Communities took place. Co-design activities were organized that aimed at: 1) creating a shared understanding and design language among the co-design partners, and 2) mapping of the Content Communities' media practices, needs and ideas in ways that could inform the development of the Fusion software, and SMAK in particular. At this point, the software development team needed input for producing early prototypes of media applications built with initial SMAK components (i.e., reusable software building blocks).

The collaboration with the communities took place mainly face-to-face and via emails, proceeding gradually towards a more in-depth understanding of the communities' current and potential media practices (table 1). Semi-structured interviews were conducted first, in order to understand the social structure and current media sharing practices of the communities (themes included, for example, what kind of activities the community has and how media is shared currently). After this, two co-design workshops were organized, which engaged the project team (researchers, interaction designers and software developers) and the community members in collaborative design activities, producing further insight to the communities' media practices and needs, as well as design ideas and artefacts. The interviews and workshops were organized individually with each community so that a couple of members per community participated in the activities (usually the same members, men and women, aged around 30 years) with two to four people from the project team. These approximately two-hour meetings were documented on video in addition to notes and photos. Ultimately, the findings of the co-design activities were summarized and communicated in the form of Community Application Concepts for each community to inform the development of SMAK. The methods used in the co-design workshops are described in the next sections.

Activities with the Content Communities	Outcomes	Design document
I. Interviews	Initial understanding of the communities' structure and current media sharing practices	Community Application Concepts
II. SMAK Toys workshops	Mappings of interesting and useful media usage and sharing considering community practices	
III. Scenario and paper prototyping workshops	Further info on the communities' media practices and concrete design ideas regarding media applications	

Table 1: Activities and their outcomes in the second co-design phase.

Designing the SMAK Toys co-design tool

The project team at TAIK designed a collaborative design tool called the SMAK Toys for the co-design workshops with the communities. This was done in small, iterative workshops among project researchers, interaction designers and software developers. SMAK Toys is a set of about 30 magnetic cards that represent different types of media content, as well as ways to use and share the content (Figure 2, left). The individual cards are "building blocks" intended to facilitate creation of a shared design language, a common understanding about practices and a strategy for how they could be translated into the design of a component-based software toolkit (SMAK). The tool is inspired by methods that utilize low-tech elements to engage users in the design process such as PICTIVE (Muller 1991), and similar tools that have been used to help in making the features and functions of intangible digital systems more concrete and easier to connect to everyday life practices in the design and ideation activities (see, e.g., Botero et al. 2002). This toy-like design tool was motivated by the complexity of the software being designed (toolkit) plus the fact that most of the community members had not participated before in software development, and some had only limited experience of new digital technologies and social media.

Mapping with SMAK Toys

The first workshops with the Content Communities focused on finding out what kind of media usage and sharing would be useful and interesting for the communities, considering their practices. With this collaborative design

exercise, we attempted to find initial answers to the following questions to provide input to the software development: 1) What types of media content did the communities want to use and share? 2) How would the communities like to use and collaboratively enrich the media content? 3) What kind of privacy and access management issues are relevant for the communities in media sharing?

The workshops began with an introduction, which included elaboration of the SMAK toolkit-in particular, how the aim was to develop not a fixed application, but a toolkit for building media sharing applications. The ideas of components and of applications built using such "building blocks" were illustrated with simple example pictures. After this, relevant SMAK Toys cards were selected and grouped collaboratively. The set of SMAK Toys cards used consisted of six subsets of pre-defined, colour-coded cards grouped by their functions (e.g., media content types, tools for adding metadata such as tags, user roles with different access rights), as well as empty cards on which new ideas could be written. The community members chose cards that they found relevant for their community practices, and also created new ones using the empty cards. The sessions usually started by picking out the media content types (e.g., video), and then selecting and prioritizing how the community members would like to use or manipulate the content (e.g., by commenting or annotating). The cards were attached onto a whiteboard, which enabled dynamic grouping and rearrangement of the cards as well as adding of complementary drawings and text next to the cards. The outcome of each workshop was a "map" that illustrated the community's media practice (Figure 2, middle).

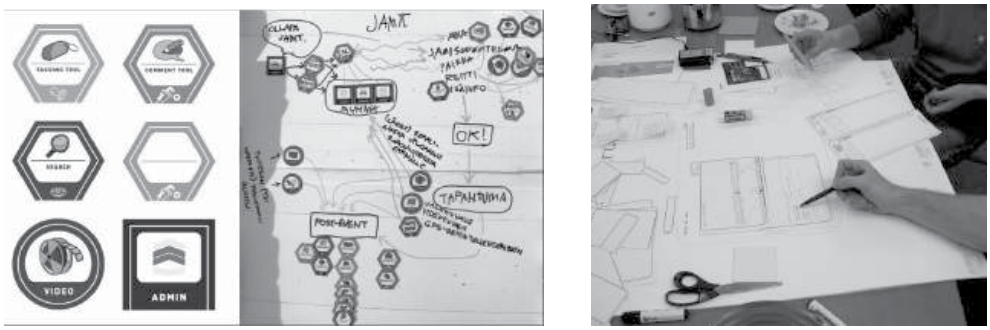

Figure 2: SMAK Toys cards (left) and mapping (middle), and paper prototyping (right)

Creating scenarios and paper prototypes

These workshops aimed to provide further information on the communities' media practices as well as concrete design ideas regarding media applications. We discussed first briefly the mappings created earlier with the SMAK Toys and any thoughts or ideas that the community members had since the last workshop. After this, the community members created and wrote down with the help of the

project team one or two scenarios which described potential media-sharing situations for the community (e.g., sharing of photos and videos of a community event). The scenarios were based partially on the discussions in the last workshop and outlined how the community members would like to use and share audiovisual content, ignoring their current restrictions. Next, the community members were asked to create a paper prototype of a media application on a large paper sheet using paper elements, colourful stickers, pens, scissors, sticky notes and glue as materials (Figure 2, right). The aim was to summarize and concretize the design ideas developed during the previous activities. No particular instructions were given regarding the prototypes except that we asked the community members to make a sketch of a media application that would show functionalities they find important to have readily available (a kind of application "main page").

Results of the co-design process

The main outcomes of the first co-design phase were a mapping of different types of potential Content Communities, co-design partnerships with the Content Communities, and establishment of an initial roadmap and co-design framework with the co-design partners. The co-design activities with the Content Communities in the second phase provided multifaceted insight to the communities' media practices, as well as insight into the feasibility of the potential software toolkit structure.

Although there was some overlap between the communities' needs, each of the Finnish Content Communities had unique media practices, which could be potentially facilitated with new tools that enable sharing and collaborative enrichment of audiovisual content. For example, locative information, such as GPS coordinates and routes, were found to be important for one of the parkour enthusiasts' training and video practices. A mobile interface for sharing audiovisual content was also essential for this community, as their activities usually take place on the move. The extended family, for one, was interested in sharing videos and video compilations via "channels" among the family members, and also exporting some of the content to their existing blogs. On the other hand, being able to collaboratively comment and tag media files was relevant for the practices of all the communities.

The findings of the interviews and workshops organized with the communities were summarized in rich Community Application Concepts for each community. The purpose of the concepts was to provide concrete ideas for implementing gradually initial SMAK component and media application prototypes. The concepts were communicated among the project partners using a common template including text and pictures in order to facilitate identification of overlap between the different concepts and issues that needed more input. They also served as a basis for functional specifications for the

SMAK software components. The concepts provided the following types of information for the software development team: 1) types of media content that the communities want to use and share (e.g., video, photos); 2) descriptions of the communities' media practices; 3) list of basic functions needed for accessing the content (e.g. video player); 4) list of more complicated and social functions (e.g., tagging, commenting and annotating of content, video editing, additional interfaces such as APIs); and 5) list of functions needed for access management (e.g., "administrator" user role).

The co-design process also provided valuable input for the whole Fusion platform design. As the Content Communities had an existing social network and identity online, it was essential for them to be able to integrate new software into their existing digital ecosystem of tools and services. This led to the development of the Web Bridge application that serves as a bridge between the P2P network and the World Wide Web.

After evaluating the Community Application Concepts of the Finnish, Hungarian and Dutch Content Communities with the project partners, three demo applications were developed. These did not match any individual concept, but aimed to capture components and functions that could support most of the common, and some of the more specific, media practices identified in the co-design. For example, one of the applications provided ways to integrate locative information with media, as this type of practice was identified in some of the Finnish and Hungarian communities. The prototype applications were then explored and evaluated in the 3rd co-design phase with the Content Communities and some new people that had not participated yet in the co-design.

Discussion and lessons learned

In this section we will discuss the experiences and main lessons learned from the case study described in this chapter. We will address, for example, the challenges of developing a co-design framework and approach in a multidisciplinary environment and design partnership. We will also evaluate the success of the co-design methods and tools used during the process. Based on our experiences, we will propose strategies and means to support and facilitate people's activities, and how to empower them to act as "everyday designers".

Co-design framework in multidisciplinary environment

The P2P-Fusion project's context set some fairly strict constraints: the consortium, budgets, project activities and deliverables had to be fixed before the project started, and had to follow the original proposal quite faithfully. However, the commitment to the co-design approach from the beginning of the

project made it possible to have the resources to devote to the work, in terms of personnel, work hours, and workshops. Effort was invested in facilitating formation of a shared co-design framework among the project partners. Although this was, in retrospect, a positive experience, initiating and maintaining the co-design approach turned out to be more challenging than anticipated. The co-design approach is still relatively uncommon in software design, although the ideas underlying participative design approaches are not new (Sanders & Stappers 2008). It therefore seems that for the co-design approach to be applied in such a large, distributed and multi-disciplinary project as ours, it requires a very carefully planned strategy for effective mobilization of the co-design partners.

In addition, it is essential to include early as well as periodical activities dedicated to developing a shared co-design framework and language. Nurturing the co-design approach and concretizing the value of each of the co-design partners' efforts to the design process is important, as the lack of common design philosophy may blur the design goals and decrease the partners' motivation.

Design partnerships: collaborating with the Content Communities

It seemed relatively easy for the Content Communities to grasp their role as co-designers in the project and the idea that their input would form the basis for developing the Fusion system and SMAK. This was a positive finding, as the P2P-Fusion project was the first software design experience for most of the community members. The challenges in the collaboration with the communities were related mostly to communicating the idea of a software toolkit as well as the underlying P2P technology, with its potential and limitations. Another important factor that affected the sustaining of the co-design relationship with the communities was that the project team had difficulties in providing mature enough software for the communities to explore. Developing high-fidelity prototypes fast is particularly challenging in large and distributed projects dealing with issues of overall system/service architecture and integration (Kurvinen et al. 2006). Not being to able to provide concrete examples of the system being designed, or providing prototypes that do not match expectations, had a negative effect on the enthusiasm of the communities. Timing of user involvement is crucial in the software development process, and in retrospect, it might have been better to collaborate in the beginning mainly with some lead users or developers instead of several communities, and later on, when the technological foundation had been solidified, involve a larger number of people in the process.

Another observation from the co-design partnerships with the communities is that it is important to choose motivated co-design partners and create an open atmosphere from the start. It is essential that the people who participate in the

collaborative design process have real life needs and/or practices that can provide input to the design process. This does not mean that the participants need to be technology experts or familiar with software in general. Also, their practices do not have to be directly related to the domain of design-sometimes practices that are in some way marginal may provide innovative insight for design (see, e.g., Ljungblad & Holmquist 2007; Naukkarinen et al. 2009). For example, in the P2P-Fusion project, the parkour enthusiasts gave a lot of useful information for the designers, helping them to envision how locative information could integrate with audiovisual media sharing. Collaboration with different kinds of communities was suited well for the software toolkit design in the project, but naturally the selection of design partners depends on the type of software being designed, as well as on its maturity.

Some more practical observations were also made during the project regarding the co-design partnership with the Content Communities. When co-designing with people who are not paid professionals working for the project, it is advisable to discuss the level and nature of engagement among the collaborators periodically during the design process. As these people participate often in projects on a volunteer basis, there should be common understanding of how much time and effort the participants are willing to invest in the project. In addition, an emphasis should be on planning and articulating what are the concrete and intangible benefits for communities to participate in the co-design process; in other words, what do co-design partners obtain in return for investing their time, skills and expertise in their practices? Although the communities were given access, for example, to the open source Fusion software and practical knowledge produced in the project, other compensation mechanisms might also have been implemented. It should also be recognized that people have various skills and expertises, and different motivations to take part in a co-design process; therefore, the process should be open-ended to support flexible agency without predefined roles.

However, it should also be noted that choosing motivated co-design partners in the beginning of a project does not lead automatically to a sustained and successful design partnership. Good communication and openness are essential in interaction among design partners; it is important to keep everyone periodically updated about the status of the project and the use of different parties' design input in the process. It should also be kept in mind that collaboration with design partners might be interrupted or finished for reasons such as changes in participant's needs, interests, available time and resources. Longer projects in particular should thus be flexible with respect to these factors. The inclusion of many communities in the design process facilitated coping with these issues in the P2P-Fusion project, as it enabled adjusting the level of engagement of different communities according to their interests.

Several methods and tools were used during the co-design process to engage people in collaborative design. The use of low-fidelity design tools such as the SMAK Toys and paper prototypes in the ideation and feature-harvesting phase seemed to work well in creating a common language among the design partners, as they enabled the communities to express their practices, needs and interests without needing to know technological details. The use of hands-on exercises also concretized the design ideas. However, the ideas that came up in the collaborative design sessions were not always in line with the project objectives that were defined before the process by the project plan and thus our contract with EU. Also, many more ideas were produced than what was possible to implement in the software prototypes. These imbalances challenged the ideals of the co-design approach, and in retrospect, should have been better anticipated. For example, a process could have been designed regarding how to share the so-called supplementary ideas developed with communities so that the future developers of the Fusion system and SMAK toolkit, or other similar systems, could utilize them easily (i.e., sharing ideas and scenarios with external developers and other OS projects in online cooperative platforms).

One of the key insights of the co-design process was that the professional designers should provide access to resources and tools to encourage communities to share their experiences, knowledge or designs with their peers. The interactions between the project team and the communities were based largely on face-to-face meetings and e-mail. Although some wiki-based tools for online collaboration were made available (e.g., learn.p2p-fusion.org), they were used mostly for publishing instructions and tips related to the Fusion software prototypes. Looking back, professional designers should have provided access to the project's resources with contextualization of data and guidance for multiple levels of appropriation of the software (e.g., customization, configuration, coding modules) that would enhance different agencies. As well, more interactive and sophisticated online tools could have been used to promote discussion among the co-design partners. This could have facilitated exchange of experiences, ideas and knowledge between, for example, Content Communities in different countries who had similar interests, and make the design process more transparent across groups and organization boundaries. However, using online tools for fostering discussion among software developers and user representatives to inform design is challenging even when a dedicated online community of product enthusiasts already exists (Hess et al. 2008). Existing tools such as wikis and discussion forums do not necessarily work immediately without customizing and require active updating and moderation in order to be satisfactory.

The P2P-Fusion project's fundamental hypothesis was that social video creation and sharing within communities of interest would greatly benefit from certain kinds of new tools. The Fusion system was also designed with various empowering intentions, such as freedom from centralized servers and commercial services and the inclusion of a software toolkit for designing custom applications. The process was designed to be inclusive and collaborative, with an emphasis on the discovery and collaborative evolution of the Content Communities' audiovisual practices, and on the potential creative interactions between the various user communities involved in the project. The chosen strategy also acknowledged people as potential designers of the Fusion software system, and provided an open access to different levels of software from source code to APIs and CSS.

At the core of the project's end-user empowerment is the produced SMAK ToolKit, which contains reusable software components that interested parties can use and develop further in various purposes. Toolkit development is much more difficult from a software design point of view than developing fixed applications (see, e.g., Suzi et al. 2009). A designable toolkit introduces an additional layer of abstraction into the design process, which makes it cognitively more challenging for all participants to envision the target of the design. A great challenge in developing SMAK was determining how the features of the not-yet-existing software toolkit could be discussed in a way that was not too technical, abstract and confusing. How could the available functionality be presented concretely enough to make sense, but without too much rigidity, to make its potential for new designs evident? We attempted to tackle these issues, for example, by designing and using the SMAK Toys in the beginning of the co-design process. The SMAK Toys proved to be an effective way to concretize the complexity of toolkit components, help in creating a shared design language, and facilitate connecting the communities' practices to the toolkit functions. Similar low-fidelity co-design tools could be developed in the future to support early phases of software toolkit design. However, in the later phases of the development, hands-on experimentation with functional prototypes is recommended in order to obtain more realistic input regarding the adaptability of toolkits into people' practices.

In P2P-Fusion, the development of the toolkit to a level that could be easily demonstrated took longer than expected. In terms of results, the final system did not fully meet the goals we had set for ourselves, due to severe limitations we encountered in key technologies, and hence did not fully realize the empowering impact that we had hoped for. Had we known in the early phases of the project what we know now, the overall co-design process would have been easier to plan, starting from the technological roadmap to the co-design input. Despite the difficulties and challenges, we generally believe that there is now more than ever a need for this type of approach to design due to the opportunities created

by, for example, Web 2.0 resources and techniques (e.g., mash ups, widgets, APIs and even simple skinning through CSS). We anticipate that it will be hard to develop integrated toolkits that could satisfy the massive diversity in end-user practices, and instead it will be increasingly common that popular software systems will be constructed by connecting diverse designable and adaptable components together, and that these components and their capabilities will increasingly become familiar to end-users through everyday practice. It will thus be a worthwhile effort to design these kinds of tools with ecosystemic compatibility and end-user designability in mind.

Conclusions

We have presented a case in which a software toolkit was co-designed together by communities of everyday people whose media practices formed the starting point and the core of the design and development process. The chosen community practice-driven design approach, together with appropriate co-design tools, proved to be a suitable method for a software toolkit design. Our case also indicates that "everyday designers" without programming skills or knowledge of complex technology solutions (e.g., P2P technology) can be engaged in the design process if their participation is facilitated and supported via multiple means of interactions.

The co-design with Content Communities provided an abundance of material that provided insight to the current and emerging media practices of different types of communities. Using practices as a unit of analysis in the software design process helped in contextualizing the communities' media use in larger ecosystems of people, tools and resources. The Community Application Concepts also proved to be useful in transferring the co-design findings as shared design documents to efficiently guide and structure the software design and development process. The most challenging aspect in the co-design was to establish a shared understanding of the software toolkit, as the concept of toolkit is rather abstract, and people are not familiar with toolkits. However, our experiences in using the SMAK Toys for connecting the real-world community practices with the toolkit component design were positive, and encourage development of further low-fidelity co-design tools to support early phases of software toolkit design.

We conclude that, in the long run, an open-ended system with development options may be a more sustainable investment than a specific application, allowing for more independence for end-users as well as flexibility in systems. In spite of its challenges, design for openness and for designability is something that designers, technology developers and institutions need to learn, because in the rapidly evolving global and open digital ecosystem, only collaborative and designable systems and components will be able to respond to the increasingly sophisticated demands of the evolution of the practices of people.

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2.

The ‘Openness Turn’ in Co-design. From Usability, Sociability and Designability Towards Openness.

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ABSTRACT

Building upon both design research theory and practice, this paper explores the evolving field of co-design, and aims to interrogate some of the antecedent and contemporary understandings of the field found in the literature. We argue that these different understandings are mediated by a series of ‘turns’ we identify as: usability, sociability and designability. Moreover we illustrate how a fourth turn - the openness - is entering the stage. Finally, we introduce the concept of commons *as a way of reflecting on the future of co-design.*

KEYWORDS

co-design, commons, openness, turns

INTRODUCTION

New technological possibilities for ordinary people to collaborate are enabling new ways of performing creative actions and participating in design and production. This challenges our way of thinking design and production, and affects the landscape of collaborative design research and practice.

Design research and related fields like HCI and Interaction design have broadened their locus from “human factors to human actors” (Bannon 1991). Also in the last decades “designers have been moving increasingly closer to the future users of what they design” (Sanders & Stappers 2008, p. 5). Building upon both design research theory and practice, this paper conceptualizes and critically explores the evolving practices of co-design, and interrogates some of the antecedent and contemporary understandings of the field. We argue that these different understandings are mediated by a series of ‘turns’. We refer to them as: usability, sociability and designability

turns. Moreover we highlight how a fourth turn - the openness turn - is entering the stage. We adopt the concept of "turns" as a vehicle to communicate the developments, rather than discussing paradigm shifts, as we want to see these shifts as parallel and overlapping. Based on a review of literature and practice in areas that are shaping the discourse in co-design, we construct the four turns based on key differences relating to the *co* in co-design: distinctions relating to design outcomes, actors relationship between collaborators, and means and tools of collaboration. Finally, we introduce the concept of *commons* as a way of reflecting on the possibilities of participants in co-design endeavours to influence and negotiate issues like modes of governance and ownership.

In critically interrogating the *co* of co-design and advocating for an openness turn, we are drawing attention how open modalities of collaboration in contemporary culture are key in developing sustained collaborative and open design processes that will keep co-design relevant in the future.

The paper is structured as follows: We first briefly introduce the understanding of co-design we use in this paper. We then identify three turns that have shaped design practice and research and set the stage for the last turn we define as the openness turn. We sum up our findings though a summary table and finally discuss some implications of the openness turn.

SITUATING THE *CO* IN CO-DESIGN

The relationship between the *co* in co-design and other co's like co-creation is not simple or straightforward (see Sanders & Stappers 2008 and Mattelmäki & Visser 2011). In general terms we think it is useful to recognize that the concepts stem from different professional backgrounds and thus the vocabulary and focus of attention in research is somehow different.

Work on co-creation is for example derived mostly from the management and marketing studies perspective where the issue of how value is created and captured is at the centre of the inquiry (see e.g. Prahalad & Rmashwamy 2004). Work on 'co-design" on the contrary derive from disciplines associated with product/ technology design and development. In contrast to "co-creation´s" interest in value, the preoccupation in framing "co-design" has been at the level of the relationships between those "imagining" new products and those using them; put simply co-design is

interested in user-designer relationships (Voss et al. 2008). From that perspective co-design has come to mean a variety of things and activities.

Sometimes co-design is referred to as successful user involvement in concept design (Sanders & Stappers 2008). Other times the term has more connotations of a collaborative learning process between designers and practitioners (Suchman 1987; Ehn 1988; Greenbaum & Kyng 1991) and the creation of "in-between" spaces for collaboration between developers and users (Muller 2002). A widely quoted definition states that co-design is "collective creativity as it is applied across the whole span of a design process" (Sanders & Stappers 2008, p. 6).

In the remaining of the paper we will focus on the co-design aspects as they have been addressed in design research literature on digital media and technologies. In such settings co-design, besides methods and roles, can also be considered as the situated and collaborative expansion of the design spaces available to people (Botero et al. 2010). Here co-design does not refer just to a process, a space or a product but can also come to mean a collective developing of commons and culture. Thus when talking about co-design in this paper we refer both to design activities carried out by professional designers in a process with others, and to the collaborative design activities by groups of people together with experts and by themselves. We therefore argue for abandoning sharp distinctions between "use time" and "design time" (Fischer 2011), and acknowledge the relevance of co-design both in "use-before-use" and "design-after-design" (Redström 2008; Botero & Hyysalo 2013).

TURNS IN CO-DESIGN

As the previous section reviewed, various attempts at classifying the evolution of co-design have been made. Against this background we propose a framework for understanding co-design and its evolution in terms of a series of turns. We use the term evolution in a permissive way – combining it with turns to stress that each turn builds upon the previous ones, re-orienting the field without replacing completely what is already there. Combining evolution and turns has the advantage of implying a historicity of the field – that we find lacking in those frameworks that simply map different design research approaches – while avoiding the determinism of paradigm shifts.

The notion of a turn has been used to call for change – for turning away from something and towards something else. In his seminal book *The Semantic Turn: A new foundation for design* (2005), Klaus Krippendorff

argues that design needs to focus more on the semantics and value of artefacts rather than functions or intended use. He thus calls for a "turn" to semantics. Other researchers have called for other turns, like the "aesthetic turn" (see e.g. Udsen & Jørgensen 2005). We will not only be advocating for a new turn, but start by reviewing design research literature and practice to identify existing turns and explain their understandings of the *co* in co-design. Finally, we discuss the fourth emerging turn - openness - and advocate how it can build upon previous turns.

Usability Turn

By the "usability turn" we refer to the practices of professional designers whose focus has a clear emphasis on use and use situations. This turn has provided impulse to the User Centred Design (UCD) movement and constitutes much of the basis of research and literature in the Human Computer Interaction field (HCI) (Grudin 1990, 2012), particularly the phases referred as 1st and 2nd wave of HCI (see e.g. Bødker 2006).

This turn is characterized by an interest in scientific measurement and evaluation of use and usability (see e.g. Dumas & Redish 1993; Human-Centred Design ISO-1999) deemed necessary when people other than trained technical professionals began to use computer systems (Kuutti 2009).

In the usability turn, defining and evaluating usability is addressed by a multidisciplinary team. The team invites specific users to inform and evaluate a product through e.g. a focus group or usability evaluation. Users are seen as achieving predefined tasks. Their role, when cooperating with designers and developers, is mainly to provide information – quantitative and qualitative - about the use and use context. Involvement of people can also be representational, meaning that use situations are being simulated by a professional in the design team, that represents the users and their needs. The focus is on how the product performs for the user (Norman 1988).

In the literature various methods and mechanisms to probe use and users are reported and evaluated (e.g. Sharp et al. 2007). Proponents of this turn have developed ways to communicate knowledge about users like e.g. *Personas* (Cooper 1999), communicate contexts of use and activities in the form *Scenarios* (Carroll 1995) and structured ways to document user actions such as *Task Analysis* (Hackos & Redish, 1998) that are then translated into design language (e.g. wireframes and user requirements). The usability turn provided standardized and efficient ways of dealing with

use and collaborating around it at design time, and has looked at, how users adapt or misuse designs after design time.

Sociability Turn

What we refer to as the "sociability turn" encompasses efforts that explicitly recognise and address the social aspects of both design work and of use. Issues around the sociability turn can be recognized mostly in literature around the Participatory Design (PD) movement (e.g. Greenbaum & Kyng 1991; Simonsen & Robertson 2013) the Computer Supported Cooperative Work field (CSCW), and in the HCI literature dealing with third wave concerns (Bødker 2006).

The sociality turn is characterized by attention to the relationship between peoples' practices and to facilitating stakeholders' contributions (Ehn 2008; Redström 2008). It sees use in the context of situated actions (Suchman 1987), practices (drawing on e.g. Reckwitz 2002) and communities of practice (Lave & Wenger 1991). Here, users are a key part of the design process, rethinking and exploring existing designs and alternative futures through use. The methods of observing use and simulating use situations (e.g. Sanders et al. 2010) have drawn on ethnographic inquiries (e.g. Suchman 1987; Ehn 1988) to produce thick descriptions. Simulating use is also achieved via prototyping (Bødker & Grønbæk 1991), cultural and design probes (Mattelmäki 2006) and games (Brandt 2006).

The sociality turn literature sees design collaboration as enacted through organized events (e.g. workshops) initiated by experts and thinking of users as stakeholders that form partnerships (Sanders & Stappers 2008). Contributions however are usually situated in the ideation or conceptual design phase (Sanders & Stappers 2008; Botero & Hyysalo 2013). Although for contextual inquiries and for thick descriptions of practice, involvement of participants expands to include actual use time in situ (Botero & Hyysalo 2013).

It is important to note that the turn towards sociability aspects does not only refer to the inclusion of people in the design process or for the need to support cooperative actions. It also encompasses a new set of things to be designed. When focus shifted from more from human computer interaction to also to people interacting with each other via devices and networks, new areas of design emerged. Think for example of online participation platforms such as YouTube, Facebook, where new designs are needed to guide use (policies such as terms of use, copyright agreements) and participation (community guidelines, access management mechanisms), in

addition to foster cooperation (e.g. good practices) and creative actions by people.

Because sociality is multidimensional, the core design dimensions of this turn are then threefold: 1) Designing for participation in a design process or design space, 2) Designing for collaboration, that facilitates and supports collaboration and interactions between people in design, 3) Designing for sociability in changing socio-cultural settings.

Designability Turn

In the third turn, "designability turn", we move towards design work attentive to the design needs of contributors, even end-users themselves. Issues relevant to designability have been raised in the literature in PD (e.g. Harstwood 2002; Botero & Saad Sulonen 2010), design research in general (Krippendorff 2005), and in what has been lately called End-User Development (EUD) field (Lieberman et al. 2006).

The designability turn is characterized by advocacy for environments and systems where use is stimulated and triggered. Focusing on people's design-after-design activities (Redström 2008) is at the core. An important goal is to design and develop during design time, environments and "systems" that are purposefully under-designed. One strategy is Meta-Design; the creation of social and technical infrastructures to enable novel forms of collaborative design and development (Fischer & Giaccardi 2004). Users are seen as potential designers extending, improving and appropriating designs. For that reason they need to be empowered "to act as designers" (Fischer & Giaccardi 2004), and provided with tools and support to do so (Hartswood et al. 2002). Facilitation takes place through flexible systems and services, tailored and developed further by their users, such as customizable applications, building blocks and software toolkits (Marttila et al. 2011). Similarly, as in the innovation literature that highlights the roles of so-called lead users who engage in design and development of products aided by toolkits, libraries and modules (von Hippel 2005).

Designability turn thus implies bridging participatory activities towards those of evolving life contexts (Fischer & Giaccardi 2004; Saad Sulonen et al. 2012) in the frame of 'cultures of participation' (Fischer 2011). From the professional designer's point of view, the challenge of designability is to design resources that present a potential for designing, while supporting the process of a-synchronous adaptation and appropriation in real-time use.

TOWARDS OPENNESS

The previous sections show that throughout the three turns in co-design there has been a drive towards opening the design activity to ever more open co-operation. The forth turn, what we refer as the "openness turn", builds on this drive and extends it. In our attempt to define the openness turn, we both identify changes underway and argue for changes that we think can help harness and develop openness in co-design practices. The following treatment is therefore both descriptive of new practices emerging, and advocative in that it seeks to set out an agenda for how the openness turn can and should shape co-design more broadly.

Co-desing is inclusive and can be seen as incorporating already some aspects of openness. Nevertheless, it is only until recently that the concept 'open' has been introduced. Partly because the turn to openness in design has so far been driven by practice rather than theory there is no shared meaning. This is however beginning to change. A recent compilation called *Open Design Now. Why Design Cannot Remain Exclusive* (2011), for example, seeks to provide a review of the emerging field. *The Design Journal* has also produced a special issue on openness (Roel 2012). In addition, emerging empirical research analyzes an extensive set of open design projects of both intangible and tangible goods (Balka 2011; West & O'Mahoney 2008). Definitions of open design are evolving also in a peer-driven process carried out by e.g. the Open Knowledge Foundation (OKF 2013).

Different degrees of openness have been developed based on criteria such as: *transparency*, *accessibility* (West and O'Mahony, 2008) and *replicability* (Balka 2011). In addition to those aspects, features such as remixability, shareability and forkability of designs are also discussed (Balka 2011). However openness in design projects does not denote only accessibility and re-usability of tangible modules. Realizing a design may require other forms of designs (e.g. social practices and agreements) (Botero et al. 2010) that should also become part of the equation. This points to the multidimensionality of openness in design. For instance, Avital (2011) classifies openness in terms of conceptual layers: object (design blueprints), process (means of production), work practice, and an infrastructure layer encompassing both technical and institutional foundations for design (Avital 2011, p. 52).

Two main strands can be identified in the practice and literature on open design; a predominant one focusing on design artefacts where the emphasis is put on the openness of publicly available designs (e.g. blue prints as

documents). The other strand is focusing on open-ended design activity and practice (see Abel et al. 2011). This second notion of openness is indicated in co-design research calling for engagement as *infrastructuring* (Björgvisson et al. 2012) and Community-based Participatory Design (DiSalvo et al 2012) unfortunately without addressing openness straight on.

A point of departure for addressing this could be the literature on new modes and characteristics of peer production (e.g. Benkler 2006; Bauwens 2009; Bruns 2008; Engeström 2008) specially those that deal with social networks and digital participation platforms online. An insight provided by this research is that open production and creation often rely on *commons*. Commons are a resource or a resource system shared and generated by a group of people. Ostrom have demonstrated that in order to sustain commons, clearly defined rules and boundaries, and mechanisms for self-governance and monitoring should be in place (Ostrom 1990). Along the same lines control over the used resources is also discussed in context of peer and commons-based production (see e.g. Benkler 2006; Bauwens 2009). These implications of commons and modes or peer production could be linked much closer to collaborative design efforts.

Table 1 below aims at summarizing the main points of each turn discussed so far to allow for comparison and reflection.

Turns:	**Usability**	**Sociability**	**Designability**	**Openness**
Frameworks	Human-Computer Interaction (1st and 2nd wave)	Participatory Design (PD) HCI (3rd wave) Computer-Supported Cooperative Work (CSCW)	Meta-design End-User Development (EUD)	Open Design, Open production Community-based Participatory Design
Main objective	*Representing use* Understanding task flows,	*Observing use* *Simulating use* Understanding Practices and experiences	*Stimulating and triggering use* environments	*Performing use* Design for collaboration
Object of co-design	Product	Practice	System	Ecologies, Infrastructures
What users do?	Adapting Misusing	Exploring Rethinking	Extending Improving, Appropriating	Reinventing Forking, Remixing,
Who collaborates?	Expert team (One-shot events by invitation)	Expanded team (pre-defined process)	Expanded team (open-ended)	Peers (on going- long term commitment)
Relation-ship between collaborators	*Individuals* - Designers reach out to users - Users are informants and in need of representation	*Partners* - Designers facilitate and stage events - Users are Stakeholders	*Communities* - Designers provide tools - Users are potential lead users	*Collectives* - Designers and users are both part of publics
Through what is collaboration enacted?	Personas Scenarios Flow-charts	Prototypes (paper, functional) Thick descriptions of practice Workshops, games Probes	Building blocks Platforms Hacks Toolkits	Repositories Documentation Forks and Spin offs
Modes of production	Mass production, industrial manufacturing		Mass Customization and personalization	Commons based, peer – social production

CONCLUSIONS: FROM OPEN ARTIFACTS TOWARDS OPEN COMMONS

In our attempt to understand the "Openness Turn" in co-design it is noteworthy to understand how a main drive has been moving closer to people. Another is to remind us of how attributes such as democracy and freedom share connotations with openness, and have been inspiring movements relevant to co-design (e.g. Participatory Design movement). We have traced these developments through four turns in co-design practice and research. First, the usability turn brought people in as users of designed artefacts. Secondly, the sociability turn expanded the space of design stakeholders to be seen as partners. Thirdly, the designability acknowledged non-professionals as designers. Finally, the openness turn locates design in open peer-driven process taking place in a commons that can be nurtured and infrastructured by designers and other collaborators. We must turn more seriously to the implications of creating such commons to ensure the sustainability and relevance of co-design in the future. We hope our work is a contribution in that direction.

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3.

Rights to Remember?
How Copyrights Complicate Media Design

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ABSTRACT

This paper argues that copyright issues are an overlooked factor in the design of digital participation platforms for audiovisual cultural heritage. Digitization of cultural heritage is an endeavor that aims to preserve and make digital culture available for an engaged online participation, but in practice we see that content copyrights frustrate this aim. Discussing the design process behind the EUscreen portal, and presenting a survey that guided its development, the article shows how copyrights become a driver of the design process and override goals of human-centered and participatory design, and design for collective action. Rather than *design-after-design* the project became a *design-after-rights* exercise in which the copyrights of digital cultural heritage placed tight constraints on both the content use and selection, and the platform design itself.

Author Keywords
Media design; cultural heritage; digitalization; audiovisual; collaboration; intellectual property; copyrights.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Europe has invested billions of Euros in digitization of our cultural heritage. Large conservation and digitalization projects have formed and made available a large body of our shared history. For cultural and memory institutions it has created an enormous potential to expand public access to their holdings, and establish and renew a collaborative relationships with their visitors. Along with the digitalized content, an abundance of digital tools have created novel ways for people to access, appropriate and reinvent culture.

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A larger group of people has a possibility to take part in and be part of the digital culture heritage online.

Sharing authority and embracing public participation is not a new thing in the context of cultural heritage, but the discussion has evolved since 1990s [8]. Cultural and memory institutions are increasingly exploring ways to create new partnerships with publics and open the possibilities for people to curate, collect, contextualize and create cultural works from their digital collections. Within the field of human-computer interaction (HCI) there is also a growing interest for digital cultural heritage and novel interactive systems and services that could be made possible (e.g. Journal on *Computing and Cultural Heritage* and dedicated publications on the theme [see e.g. 7].

At the same time, the design of the digital archives and platforms – on which the collaborative public's creative activities rely – has become more cumbersome as platforms seek to accommodate not only the access and viewing of digitalized content, but also people's participation and collaboration in various forms. This development is both driven by and described by the emphasis on collaboration and participation [3, 6,15,25].

In the last decades designers have been moving increasingly closer to the future users of what they design [20,14], and scholars and practitioners have put emphasis on understanding the phenomena where people's media use and practices are intertwined with media consumption, design and production [17,18,20]. This is often characterized as 'participation culture': it refers to new modes of media practices and production that rely on social networks, participation platforms and common-pool resources on the Internet [see e.g. 2, 13,16]. In "a culture of participation" everyone has a possibility to be an active and creative actor, decision maker, share one's creations [11] and take part in collaborative media design [17,18,21]. Furthermore, the HCI and design research community has focused on how to facilitate and support multiple levels of creative activities by people participating online [e.g. 3,5,15,21], and developed design approaches and frameworks such as Meta-Design and End-User Development [10,11,14] to frame and discuss the design collaboration between professional designers and so called expert-amateurs and citizens in real life settings [1,16,22,24]. The professional design practice of collaborative design has evolved in turns of usability,

sociability and designability depending how the use and use situations have been addressed and understood by designers [19]. Alternatively, the development has been portrayed as three waves in HCI [6, 12]. Many scholarly efforts have reflected on the evolving relationship between "design" and "use", and have explored relationship between "use time" and "design time", and acknowledged the relevance of e.g. use-before-use and design-after-design activities [5, 9, 23].

As this paper will show, the current discourse within HCI lacks attention to an important factor that imposes restrictions on both a wide rage of media use activities online and on the design of platforms that this use is relying on. As people are increasingly acting as participants and collaborators in the media landscape, intellectual property rights (IPR) issues become evermore critical to what people can actually do, and a factor in how and what designs are actually implemented. As IPR regimes have become radically more complex, they set the requirements for media content – including its viewing, use and creative re-use [20] – and greatly influence the ability of media design to be collaborative, participative or open.

Through a design case, the EUscreen portal (www.euscreen.eu), this paper address the challenges that IPR issues pose to both the design of the portal and the kinds of use the portal can be designed for.

First we present findings from a survey that aimed to study and clarify what copyrights the audiovisual content in the EUscreen collection have, and what will these rights permit in terms of use and design of the portal. In the core of the survey are scenarios that explicate use and creative re-use of archival audiovisual content. Second, we critically reflect on what enclosure through copyright could mean for our understanding of, and access to, digital cultural heritage. While the emphasis driving the majority of projects that digitize cultural artefacts is to make cultural heritage accessible and open, the outcomes can also have an opposite ramifications. Finally, we discuss the implications that rights issues may have for media design and designers.

THE EUSCREEN CASE – EUROPEAN MEMORY THROUGH TELEVISION HERITAGE

The EUscreen project's[1] main objective was to design a portal (www.euscreen.eu) that promotes the use of television content to explore Europe's rich and diverse cultural history. The portal allows multicultural and multilingual exploration of European television content and metadata. Currently it makes publicly available a wide collection > 40 000 items of television programming of more than 20 audiovisual archives and public broadcasting companies throughout Europe.

[1] The EUscreen project run 2010-2012, and was co-funded by the European Commission. The efforts continue in the EUscreenXL project.

The project sought to address the actors and use in the following fields: learning, research, leisure, and creative re-use in open culture production. The fundamental aim of the EUscreen portal is to provide tools for multiple uses and creative activities of predefined user groups according to their identified needs and wishes[2].

In many cases these solutions require special agreements and granting specific rights for the users. In order for the project to design and provide functionalities that enable not only viewing the content through the portal, but also *use* (e.g. commenting, sharing and enriching the video content), and creative *re-use* (e.g. remix videos and new applications and services) it was necessary to understand what requirements the EUscreen collection sets for the portal and explore the consequences for its design in practice.

The challenge of Intellectual Property Rights

On a European level (e.g. in the directives, funding instruments) the discussion in relation to preservation and digitalization of cultural artefacts has encompassed a great promise of emancipation of European culture, providing a democratic and free/open access to archival content that before has been restricted. However in many cases these cultural institutions can only provide restricted access to and use of their collections due to copyright and other intellectual property rights issues. Institutions restrict access through various mechanisms, for example releasing and publishing versions with lower quality, restricting access to certain geographical area (e.g. public broadcasting corporations in various countries), or limiting the duration of access of the materials. Often Digital Rights Management (DRM) technologies are implemented to control the use of and access to digital content and limits possibilities e.g. copy, distribute or alter copyrighted materials.

The copyrights and Intellectual Property Rights (IPR) issues make it difficult to showcase audiovisual material publicly online, and different national legislations make international exchange of audiovisual material even more challenging. The IPR policies not only vary across different European countries, but also often vary widely in each country for historical and commercial reasons. The issue is widely recognized in the context of digitized European cultural heritage. *Europeana.eu*, a platform that connects hundreds cultural and memory institutions and shares millions of digitized cultural heritage artefacts with its users, and projects related to it (e.g. Europeana Connect), have developed a shared copyrights and licensing framework and established *The Europeana Copyright*

[2] The *User group definitions and Initial user requirements* report was carried out prior to the survey by the project consortium. In addition use scenarios were established in *User Scenarios in Learning, Research and Leisure/Cultural Heritage and Open Cultural Production*.

Reform Working Group to provide collective response to the public consultation of EU Copyright Rules[3]. In short, operating in digital environments and offering access to digitized collections remains cumbersome for many of the cultural heritage institutions in Europe.[4]

The diverse audiovisual materials offered by EUscreen have very different restrictions and permissions, and even though the institutions worked towards harmonizing the differences in IPR, the rights varied significantly between different memory institutions and public broadcasters. This, needless to say, posed a great challenge to the design of the EUscreen portal. The restrictions of IPR per se were not the only concern for the establishment of the online portal. There is also a large gap between citizens' online media practices and what the rights permit, as common digital media practices are frequently illegal.

As the European television heritage offered by the portal had a very diverse set of restrictions and permissions, it became essential to first study and clarify what rights the EUscreen's content providers (CPs) have granted in the context of the project and what will these rights permit in terms of *use* and *re-use*.

To obtain this information we carried out the *Intellectual Property and Rights issues Survey*. The survey focused on the video content that the CPs provide for the EUscreen portal and aimed to: 1) Map the rights clearance processes regarding the EUscreen content, including the scope of rights. 2) Provide insight into the possibilities and challenges that the used licensing schemas pose to the design and development of the EUscreen portal. The main objective for the survey was to understand limitations that the EUscreen collection sets for the design of the portal and digital tools, and provide guidance and recommendations.[5]

In practical terms, the survey themes can be summarized as follows: What type of audiovisual content is offered for the EUscreen portal? How have CPs cleared the rights/licensed their selected content for the EUscreen portal? What will these rights permit in terms of use of the EUscreen platform and content that it offers? What issues are preventing CPs from making audiovisual content available for use and/or re-use by the public? Are there some special conditions (e.g. education context, orphan works) where more "open" use is possible? What are the challenges and possibilities for future uses of the provided content?

The survey was conducted in English using an online tool called SurveyMonkey[6]. The EUscreen CPs were invited to fill in the survey via email and the project's internal online working environment, and they were asked to seek internal legal council when providing their answers, so that their input would be as accurate as possible. The majority of the respondents were members of the project, however according to the questionnaire data, some respondents had discussed questions internally in their institutions (i.e. consulting with their legal department).

The response rate for the survey was good and all except one CP completed the survey. Altogether there were 17 respondents from 16 European countries.

THE IPR ISSUES SURVEY RESULTS

Intellectual Property and Rights issues Survey had eight sections that will be elaborated and discussed below.

Content selection and the rights clearance process

The main focus of this part was to obtain information regarding how the CPs cleared the rights for the EUscreen content. In addition the survey presented questions if and how IPR is influencing the selection of the chosen content in terms of e.g. topics, genres and date range.

The survey revealed that IPR issues clearly influenced the content selection - only one CP reported that IPR does not affect its selection process at all. Due to the IPR limitations, the majority of the content selected for the portal consists of news and current affairs video clips. Four CPs also reported that they made alterations for the content selected for the EUscreen collection (e.g. removed music) due to IPR regulations. In addition some edits were made if the content was "questionable". Furthermore, some content was discarded due to privacy issues and lack of documentation of permission of use e.g. from interviewed people.

CPs reported that the rights clearance process is laborious and time consuming. In average (~2000 items per CP, 15 hours for 50 items) the total amount it will take to clear copyrights will be 600 hours, so ~5 person months. This is a considerable portion of the resources the archives have

[3] On December 5th, 2013 European Commission launched public consultation on the review of the EU copyright rules. http://ec.europa.eu/internal_market/consultations/2013/copyright-rules/index_en.htm.

[4] Although especially in the context of museums there are examples of creating open access to large collection digitized objects. One prominent reference is Rijksmuseum in the Netherlands that has released over 150.000 items under open terms of use for the public, and provides *Rijksstudio* where people can create their own cultural works using digital tools building upon the museum's online collection.

[5] It should also be noted that the EUscreen Consortium Agreement provides the foundations for the IPR schemas in the project. The content providers grant a non-exclusive, worldwide, royalty-free license on copyright, related rights and the sui generis database rights to make available, reproduce, distribute, display, transmit the databases and content on the EUscreen portal.

[6] The survey questions and scenarios can be accessed online at: https://www.surveymonkey.com/s/euscreeniprsurvey.

been allocated. Some CPs reported that existing rights agreements substantially reduce the work hours needed for the rights clearance process. Some institutions follow a two-step process: first, the content manager is curating content from a specific topic, and after that a legal expert evaluates the selection and makes the final decision of releasing the material.

The scope of rights – How can video content be used?

The main part of the survey was dedicated to clarifying the scope of rights, and inquiring into what kind of activities EUscreen portal visitors could actually do with the video content, given its copyright limitations. The section provided important input to the design of the EUscreen portal, and to the creative use and re-use activities in particular[7].

In order to avoid legal jargon and to provide useful input for the portal design, the scope of rights was enquired using concrete use scenarios, which described activities that people could do with the video content in a form of a short story. The scenarios were constructed so that they encompassed a range of activities from commenting of videos within the portal to embedding and remixing of the video content. This was based on the assumption that the thousands of videos provided for the EUscreen portal by the different CPs vary in their terms of use, allowing different degree of creative activities. The selection of the activities chosen for the scenarios was also based on the prior work done on mapping and envisioning predefined user group needs and scenarios. For each scenario, the CPs were asked to indicate whether the activities described in the scenarios could be done with their content within the licensing scheme that they were using.

For example, one scenario addressed the creation of online exhibitions:

Martijn is a fashion enthusiast. He has found several fashion-related video clips from the EUscreen portal and creates an exhibition that tells a story about early men's shoe fashion using the EUscreen exhibition tool. Martijn adds the videos into an exhibition template, and types in text on each page to elaborate the different eras and styles of shoe fashion. When the exhibition is ready, he publishes it on the EUscreen portal so that visitors of the portal can explore it. Later on, he also embeds the exhibition on his personal website.

After each scenario the CPs were asked the following: "Can the EUscreen portal visitors do the activities described in the scenario with your content?"[8]

As expected, the survey results showed that there is variation between CPs and also within their content regarding the licensing schemas and what they permit the EUscreen portal visitors to do with the content. The results are presented in more detail in the following for each seven scenarios[9]. The scenarios were produced to reflect the common online media use and practices, and envision possible future uses. The variation in the licensing schemas poses challenges for the portal design, as ideally the portal would allow creative activities for those content items that have more flexible terms of use, even if for some of the content it is possible mainly to only view it in the portal. In addition to the survey results, the following sections contain some recommendations given to the EUscreen portal design and development on the basis of the IPR schemas of the majority of the CPs' content and opinions, taking also into account the requirement of flexibility of software tools and functionalities.

Scenario 1: Commenting on videos

There are no legal obstacles regarding adding comments to videos in the EUscreen portal, but the scenario including commenting was included in the survey in order to obtain insight to opinions regarding commenting, as some providers have expressed concerns about this issue earlier. The majority of the CPs (14/17) answered that adding comments to videos is permitted for all of their content. The few providers that had concerns about irrelevant or offensive comments stated that it would be good if commenting could be turned off if necessary, or comments could be moderated for some individual videos.

Based on the responses, the general recommendation for a commenting tool is that it should allow videos and video sections to be commented by the portal visitors when they are logged in. This model of video commenting is common practice online, and there are no legal obstacles to it; however, privacy issues have to be considered. In the first phase, public commenting could be implemented, and later, if there seems to be problems with offensive comments etc., public commenting could be disabled for some videos or

[7] In this context the term creative re-use refers to the use activities online that add value or enrich the video content, e.g. sharing and embedding videos outside the EUscreen portal. On the other hand creative re-use includes activities that would require altering the video content (e.g. make video excerpts) or creating a new derivative works (e.g. video remix or mashups) using the EUscreen video content. (More detailed account on the levels of creative re-use practice online see [20]).

[8] The survey provided three alternative answers: "1) None of the activities can be done with our any of our content. 2) All of the activities can be done with All of our content. 3) The activities can be done to some extend with our content. Please specify what can/cannot be done, and whether this applies to all or some of your content."

[9] The actual scenarios are not included in this paper due the limited space of this article.

collections. Providing commenting functionalities that can be used in more private settings, such as among a group of students making a school assignment, could be also considered.

Scenario 2: Video playlists

As with commenting, majority of the CPs (15/17) answered that it is possible to create public video playlists using their content. It was thus recommended that in the EUscreen portal, an option to create playlists would be provided for all portal visitors who are logged in. In order for this feature to be more useful, easy ways to find and share playlists (e.g. via email and Facebook) could also be provided. It is important to note that a requirement to log in could allow better possibilities for the visitor to tailor and customize the portal to better fit individual needs. However group applications and social interaction add a complex level in terms of privacy issues.

Scenario 3: Embedding a video

Embedding of a video basically means taking it to another context, outside the EUscreen portal. It was expected that many CPs would not allow this. Still, about third of the providers (6/17) would allow embedding of their videos, some with the additional requirement that the embedded item has a reference or a link to the original source.

Embedding of videos is a common practice online, and would presumably be useful in the context of EUscreen, allowing the content to become part of the wider ecosystem of use including personal websites, blogs, and educational platforms. It is thus recommended that tools that enable embedding of videos are provided in the EUscreen portal. The embed items should preferably include a reference to the original source (i.e. the Content Provider). To accommodate for the variation in the licensing schemas of the EUscreen content, a flexible embedding tool could be designed, which allows more tailor-made solutions than just a dichotomy of "possible to embed" and "not possible to embed". For example, the embedding tool could provide settings with which the CP could adjust on which websites embedding is allowed, giving thus possibilities for external use for some people or organizations, instead of denying it from everyone.

Designing such a flexible embedding tool might be useful for many types of use scenarios dealing with different CPs, content, user groups and online environments – however, it would treat different portal visitors differently. Regarding the envisioned EUscreen portal tools, flexible embedding is particularly relevant in the context of e.g. video quotations (the following scenario).

Scenario 4: Video quotations

A slight majority of the CPs (10/17) responded that the video quotation – selection of a fragment of a video by marking in and out points in the video player – is possible for their content to at least some extent. The CPs main concern with the scenario related to embedding of the quotations was the possible lack of reference to the original source in the embedded items.

The possibility to create video quotations seems relevant for user groups such as educators and researchers, who wish to analyze and annotate archival videos. Also, as a more advanced feature, video quotations would add value to EUscreen portal, making it easier to for example find relevant parts of videos. The creation of public quotations could thus be allowed for the EUscreen portal visitors who are logged in. Again, flexible embedding options could be provided which allow disabling of embedding for some content, as well as an option to specify where the quotations can be embedded.

Scenario 5: Public viewing

As viewing of the EUscreen content live in events or even as a part of performances might be an interesting use scenario (e.g. video-jockey), a scenario including showing the videos in the public was included in the survey. Overall, majority of the CPs seem to allow activities that include showing their videos from the portal in public, in particular if the events in which the videos are shown are free and non-commercial.

As a general recommendation, public viewing of EUscreen content should be promoted, as this may reveal new contexts and uses for the content, promote EUscreen offline, and enable shared viewing experiences and discussion face-to-face. Thus, the portal design should communicate clearly for which video items this option is available, and whether the availability depends on the context and the nature of the event in which the video would be shown.

Scenario 6: Online exhibitions

A way to offer the content on the EUscreen in a more meaningful and contextualised way is to provide so-called virtual online exhibitions that display subsets of the content in narrated or otherwise contextualized format. Such online exhibitions have been planned for the portal, which enable CPs to showcase their content, as well as comparisons across content from different providers and countries. It can be also envisioned that in addition to the CPs and other professional curators, any EUscreen portal visitor could enrich the portal by creating small exhibitions related to topics that interest them.

The online exhibition scenario includes not only creation of an exhibition within the portal but also embedding the exhibition on a personal website. As with the other scenarios including embedding, some providers were against it, at least if the original sources are not indicated. Otherwise the majority of the CPs (14/17) seem to allow the creation of the online exhibitions within the EUscreen portal by any portal visitor.

As there is in general a permissive stance towards the creation of virtual exhibitions by not only the CPs but also by the portal visitors, it is recommended that the portal

visitors who are logged in be provided with a tool for creating exhibitions. Such tools can be seen as adding value to EUscreen, making it lively and promoting the creation of new connections and contextualization of the content. However, as some providers do not allow their content to be used freely in online exhibitions, the exhibition wizard tool could be disabled for their content. Again, it should be ensured that it is easy for the portal visitors to understand which content they can use when making exhibitions. Content available for exhibitions could be highlighted in the portal, and the search functions could provide an option to filter content that can be used in exhibitions.

Also, embedding of the virtual exhibitions or having them in some way as independent items makes sense from the perspective of experiencing the exhibitions. Embedding is one way to take the exhibitions to different contexts, outside the portal and its EUscreen branded looks. Again, flexible embedding options are recommended which allow specification of whether the exhibition can be embedded, and if so, whether there are restrictions regarding the sites of embedding.

Scenario 7: Derivative works

As expected, the majority of the CPs stated that the activities described in the derivative works scenario are not possible with their content due to IPR restrictions. However, some providers (5/17) could allow creation of derivative works such as remix videos from some of their content, or under special agreements. Were such open content provided in the context of the EUscreen project, there is a need to communicate clearly, preferably with visual means, the licensing information and the possibilities of creative re-use.

The number of video items that can be used for derivative works is relatively small compared to the whole collection available in the EUscreen portal. Implementing functions that would support the creation of derivative works of only a fraction of content might confuse portal visitors and give the wrong impression that the whole collection could be downloaded and re-used.

Providing content for creative use and re-use

After the scenario-based question, the CPs were asked what issues are preventing them in making audiovisual content available for use and re-use by the general public. It was enquired whether the current obstacles are legal, or rather due to other factors such as lack of resources. Majority of the CPs replied that legal issues are preventing providing content for creative use and re-use. In many cases chosen business strategy by the CP was identified as a reason; one CP described that there is a "generic resistance in the high management to grant use and re-use to our av (audiovisual) material".

The CPs were also asked to envision how their content could be used and re-used creatively by the general public, or by other more specific audiences, if the current challenges and obstacles would be removed. The envisioned uses included educational use (e.g. curriculum related activities), scholarly use, and local community activities (e.g. local history projects). Regarding creative use, amateur documentaries were also mentioned as one possible form of derivative works. As stated by one CP: "We could take into consideration putting our materials under Creative Commons, so that would be possible to reuse them in any kind of remixes, including mockumentary". In practice however only four CPs were willing to release content under more open terms, and altogether only a few dozens of items.

CHALLENGES IN DESIGNING "A LEGAL" PARTICIPATION PLATFORM

The survey, and the scenario questions in particular, provided important insight into IPR issues that need to be taken into account when designing the EUscreen portal, and a platform for archival audiovisual content in general. The scenario based questionnaire provided valuable insights for the EUscreen project, and especially for the designers of the portal. Scenarios functioned as a tool within the wide interdisciplinary consortium to achieve more common understanding of – not only the IPR issues – but the EUscreen portal and its possible use.

A number of general design challenges can be identified on the basis of the findings. This section presents the challenges and details how some of the challenges were addressed through design activities.

The first challenge concerns fulfilling the needs of the identified user groups such as educators and researchers. As reported above, intellectual property issues clearly influenced the content selection for the EUscreen portal. Due to the IP regulations and challenges in clearing the rights, many of the video items are news and current affairs clips, as these are produced by CP's themselves. While this type of content may be highly valuable to the user groups, it should be noted that other types of interesting and useful content are omitted. Even though the current limitations cannot be abolished, the observation that IPR strongly affects content selection and the type of content provided is important also regarding future activities and projects and portals planned around archival audiovisual content.

The survey also revealed that more 'liberal' use within special contexts (e.g. educational use) apply only for a very small part of the EUscreen material. Having said that, it should be noted that some national laws in Europe allow use in educational context without possibility to download. Nevertheless, use cases and scenarios created relied heavily on the assumption that the EUscreen content could be employed more flexibly and creatively. In other words, the survey results demonstrate that some of the scenarios are not possible due to the copyright restrictions of the video collection.

Another issue relating to the pre-defined user groups is that some CPs' licensing schemes do not permit creative re-use activities such as embedding of videos outside the EUscreen portal, hampering use that is relevant for some user groups (e.g. a teacher or an academic might wish to embed videos on their own website). It is a challenge to communicate clearly which content items can be used in more permissive ways, making them easy to find and use for the envisioned user groups.

In addition, variations in the rights and the possible uses between different video items may confuse portal users, hindering the user experience. The EUscreen portal design was thus faced with the challenge of developing user-friendly and even innovative solutions for this problem. The portal design needed to pay special attention to how the availability of possible uses and tools is communicated visually to the portal visitors. Iconic presentations such as the ones used in the context of Creative Commons (CC) licenses are one good example of communicating licensing information.

DESIGN SOLUTIONS

As the design of the portal was limited by copyright restrictions, the project had to develop new design strategies to meet the objectives and allow people to access and create different Pan-European voices. In practice, three main design strategies were chosen to overcome - or at least create workarounds around - the obstacles created by the IPR restrictions. These design activities: the EUscreen portal, pilots and experiments, and a separate open collection derived from the main EUscreen collection are discussed next.

The EUscreen beta version

The EUscreen portal (first beta version)[10] was developed to have only core functionalities, including e.g. viewing items in a video player, searching, and displaying metadata of each item from the collection.[11]

The survey results indicated that many envisioned scenarios could be possible *if* the portal visitors would be logged in, so that the visitors' identity could be identified/verified. Implementing "My EUscreen" part in the portal was addressing this specific wish of CPs, although it should be said that registered users also serves the purpose of being able to save selected audiovisual content within the portal as bookmarks. This feature is a key when creating playlists and other personal collections.

[10] Design and development of the EUscreen portal continues in the EUscreenXL project. The new version of the portal will be launched in October 2014.

[11] The EUscreen portal was designed by Aalto University and Noterik, a Dutch software development company specialized in audiovisual media.

Figure 1. The landing page of the beta version of the EUscreen portal.

Pilots and experiments

In collaboration with project partners, the authors developed pilots and experiments with representatives of envisioned user groups. These activities were carried out to demonstrate the value of scenarios of emerging media practices and creative re-use of audiovisual media.

Virtual Exhibition Builder

The main effort was the Virtual Exhibition (VE) builder and exhibitions interface in the portal. The VE builder prototype was created in a co-design process together with representatives of the EUscreen CPs. The VE builder prototype allows combining the portal's audiovisual content and text to curate and create exhibitions on a selected theme. In order to create an exhibition, users have to be logged in and bookmark content in "My EUscreen".

Figure 2. Screen shots of the Virtual Exhibition Builder prototype.

This chosen approach made it possible for CPs to curate their content and create a thematic sub-collection with contextualization and possible narrative. It was decided in the EUscreen project that in the first phase CPs – as experts of the their content – would create an exhibition and choose highlights from their own collection. Additionally, a few researchers tested the prototype and created exhibitions with content from the whole EUscreen collection. The VE builder was also tested by students to experiment with the applicability of such a tool in educational settings. The idea was to test the VE Builder internally before releasing it for public use on the EUscreen portal. Unfortunately the VE builder was never opened for public use. The reasons for this lie both in the project design and in copyright issues – namely how the copyrights would have complicated the implementation of the final VE builder tool. First and

foremost, the exhibitions could not have been embedded outside the *euscreen.eu* domain and therefore the use value for the people would have been significantly smaller. If embedding would be allowed, combining content from various CPs and sources would have required e.g. a functionality that would have checked the copyrights information and compatibility of the selected files. This is a prominent example of how IPR regimes, rather than design objectives and strategies, determines the outcome of audiovisual media design projects dealing with cultural heritage.

Figure 3. Exhibitions pages on the EUscreen portal.

One could argue that this solution is the opposite of a multi-faceted view of the European television heritage. Additionally, only CPs (or members of the project) can create exhibitions in the portal, and the exhibitions can only be viewed in the portal (one of the key functionalities identified was embedding videos and/or collections and exhibitions). A technological view aside, this design decision kept authority and curation decisions in the institutions instead of sharing authority and opening possibilities for the public to take part in the process.

Participatory video workshops

Another design strategy was to organize participatory video workshops. The main objective of the hands-on sessions was to study current and emerging remix and mashup practices (e.g. create new applications), and inform the project how to support creative re-use in a manner that would take into account the multiple levels of use activities, flexible agency and legal frameworks. According to our findings, the current key challenge in legal remixing seem to lie in finding relevant and compatible content, as well as in understanding licenses and terms of use, in particular when materials from multiple sources are combined [20]).

Figure 4. Photos from the *License to Remix!* workshop.

Despite recent technical developments on the domain it is still rather complex to take video to the next level, beyond traditional remixing. Often programming skills are needed for making use of temporal and spatial video characteristics and metadata. Combining video with other content, such as (open) metadata, had also unexplored potential. This is especially important for the EUscreen collection, as all the metadata related to the items is published as open data, and licensed under Creative Commons Zero license.

The open EUscreen collection

The project decided to use another existing platform, *Open Images*[12], in order to allow more open and creative re-use of part of the EUscreen collection. This was done under a branded section displaying content from a few of the EUscreen CPs. Open Images hosts open audiovisual content that is e.g. marked as Public Domain, or is licensed under Creative Commons (CC). In addition, it provides tools for searching content with different CC licenses, as well as an easy-to-understand visual display of the licensing information for each video. This is one of the key features to support legal creative re-use.. Open Images also provides a possibility for downloading video in different formats and sizes. Choosing this platform to showcase the open EUscreen content, though, also has a drawback, not in terms of copyright but in terms of the downloadable video quality. Most of the other videos offered by Open Images are in so low quality that re-using them for new cultural works is difficult, if not impossible (especially in combination with other video material).

DISCUSSION

As discussed in this paper, IPR issues impose major challenges on the design of platforms that make archival audiovisual materials accessible for creative use and re-use. In the following, we discuss the theoretical challenges that IPR regimes pose to projects that use media design tools and strategies to design meaningful access to and use and re-use of digital cultural heritage, based on our *Intellectual Property and Rights issues Survey*, on design activities related to the EUscreen portal and on a benchmark of other similar services, We discuss how copyrights, even when fairly liberal, shape both the design of platforms and the selection of content, thus presenting a practical challenge for media design aimed at citizen participation. We also note how digital media design projects dealing with cultural heritage risks re-introducing copyrights and endanger designing robust and sustainable cultural commons. Together, these findings challenge the promises of participation, collaboration and creative re-use that underlie both practical and scholarly discourse.

[12] *Open Images* is a Dutch initiative by Nederlands Instituut voor Beeld en Geluid together with Kennisland. More information and to access the platform visit http://www.openimages.eu/.

Collective and shared memory?

A challenge that is highly troubling for collaborative media design scholarship – can be identified: the IPR issues guide the use and creative re-use activities of archival content more than e.g. the identified and mapped needs of the predefined user groups, or what the current technology makes possible. In addition, the IPR issues not only hinder the development of the software and functionalities that would actually accommodate, facilitate and stimulate people's current and emerging media practices. This fundamentally determines how people can take part in building digital cultural commons and understanding our shared history.

The EUscreen portal attempts to facilitate a multiplicity of memories on various topics (e.g. arts and culture, conflicts) allowing citizens to access to different Pan-European voices, allowing citizens to re-use and reshape the memory of Europe and its cultural heritage. However, one could argue that when the IPR issues guide the selection and use of archival content, rather than the pre-defined selection criteria, this memory becomes distorted and legalistic rather than historical and citizen-driven. Content providers select content not based on what would be relevant, but based on what they have the rights cleared to share. Furthermore, there is a risk that developed tools are reserved to support existing frameworks and authority.

When copyrights guide what can be remembered in EUscreen as a collective memory institution, does this then create a society of dementia or amnesia rather than a lively debate in which different memories can be used in debating our common history? This is not just an academic way of looking at memory – it is sustained by real-life trials and threats of trials against people creatively using (e.g. remixing, embedding) collective memory products in their audiovisual arguments. Some memories and ways of remembering may become illegal due to unavoidable copyright infringements.

Reintroducing copyrights?

In order to facilitate the development of EUscreen, a number of similar services were studied, and we identified some of the best and worst practices. A troubling phenomenon we became aware of was that the act of designing collaboration portals and digitizing cultural heritage creates a possibility to re-license content under more restrictive terms than original analogue cultural heritage objects (i.e. works where the copyrights have expired are moved under copyright again). Tools and open license frameworks such as Creative Commons (CC) offer rights holders a more flexible ways to permit certain rights to their holdings, however some cultural institutions "misuse" the license and the tools to mark public domain content under CC license[13]. In context of EUscreen no re-licensing was introduced. But the phenomenon is relatively common, and represents one way in which commercial copyrights logics work against creative re-use and participation.

Design-after-rights?

These challenges have broader implications for how we think about media design, and complicates the encouraging views of collaborative media [as in 18,21] and cultures of participation [as in 10] facilitated by meta-design and other design approaches and frameworks. In real life media design, as demonstrated in this review of the EUscreen project, it is the IPR that determines what designers incorporate, and design becomes guided not by collaborative or participatory, human-centered or more open ended *design-after-design* ideas [23, 19], but rather by legalistic and rights-centered *design-after-rights* ideas. We might think in terms of facilitating collaboration and co-creation; but at the same time we might be enacting and facilitating restrictive IPR regimes. As [23, p. 416) puts it 'there must be something to use for actual use to happen'. So when new HCI discourses are presented without attention to the IPR issues that permeate the media design field, the risk is that scholarship misses how easily well-intentioned participatory platforms crumble under content copyrights restrictions.

CONCLUSIONS

Through critically reflecting upon the role of copyrights in the design of the EUscreen portal, this paper has discussed ways in which copyrights are 'rights to remember' when thinking about designing platforms for digital audiovisual heritage use. Copyrights are rights that must be kept in mind by both citizens and designers, and rights that in today's digital audiovisual media environment determine the ability of the collective to remember.

Firstly, copyrights emerged as the major selection parameter for what would be included on the EUscreen platform, even if user needs and the goal of giving citizens access to EU cultural heritage could have been a more desirable guiding factor for this selection. If EUscreen functions as a collective memory – as intended – and copyrights determine what EUscreen allows users to access, then copyrights literally determine what cultural heritage citizens and society has the right to remember. Secondly, from the perspective of the user who views and creatively re-uses digital cultural heritage, copyrights need to be considered as they determine the legality of such activities. Re-using digitized cultural heritage without infringing on copyrights requires the user to pay careful attention to the different copyright restrictions of different cultural heritage artefacts.

Thirdly, this article is a call for design and HCI researchers to remember and pay more sustained attention to copyrights. Much scholarship dealing with media design and participation cultures has refrained from reflecting upon the restrictions copyright places on both the design

[13] Recent examples of the phenomena include e.g. *Wellcome Library* and *Metropolitan Museum of Art*.

process and design-after-design or creative re-use activities. The paper documents how in practice the design of the EUscreen portal became guided by content copyrights, and argues that rather than enacting the *design-after-design* thinking that inspired the project, it became a *design-after-rights* exercise in which content copyrights placed tight constraints on both the content selection and the platform design itself.

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4.

Towards Commons Design in Participatory Design

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ABSTRACT
This article probes what the Participatory Design (PD) field can gain from exploring the literature on commons. Through selected examples we point to some connections and commonalities between that literature and the PD field. In doing this, we also bring forward several contributions that this literature can make to PD in order to develop design strategies and approaches to *commons design*. We believe these can further PD practices and research and help PD to operate with and thrive within increasingly complex design issues and contexts.

Author Keywords
Commons, commons design, infrastructuring

INTRODUCTION
Commons-like frameworks for collective action are becoming increasingly more visible in our digitally networked society. People who operate in these frameworks develop new forms of participation and modes of production that rely on social networks, digital platforms and shared resources on the Internet. This presents new challenges to contemporary design research and professional practice, especially in terms of understanding what participation means. The Participatory Design (PD) community has already identified and reported the need to recognise and operate in new contexts other than those of the workplace and organisations, as well as the need to move beyond the traditional software project and embrace design-in-use that is undertaken by users (Henderson & Kyng, 1991; Dittrich et al., 2002). Concepts that foreground and engage with this demand include *publics* (DiSalvo 2009; Lindström & Ståhl 2014), *things* (Ehn 2008; A. Telier 2011), community-based participatory design (DiSalvo et al., 2012; Le Dantec & Disalvo 2013) and *infrastructuring (*Björgvinsson et al., 2010/2012a/2012b*)*.

We aim to contribute to the ongoing discussion related to emerging new contexts for research and application of PD by providing insights into how research on collective action relying on commons could be relevant for the PD community. Furthermore, we ask: What could we as professional designers and researchers who operate in commons-like frameworks and aim to support collective action learn from the commons research? How can we link these ongoing discussions to the PD practices and research?

Commons-related research has a long and established tradition (see e.g. Ostrom 1990; Hess 2008; Benkler 2013) and has branched out in many directions. In this paper we introduce selected examples of commons-related literature that we think could have relevance for the PD community. Our aim is to take the first steps in establishing an initial connection between these two bodies of knowledge and sketch some questions that could guide future research agendas in PD.

We start by investigating some fundamental aspects of the concept of 'commons', as it is explored in selected contributions from the commons literature, in order to meet the special conditions for designing and sustaining commons. First, we look at Ostrom's (1990) 'design principles' of the robust and sustainable common-pool resources. We then look closer at the concept of 'infrastructuring' that has gained growing interest both in commons-related literature and in PD. Finally we discuss an alternative view – "commoning" – to rethink the roles of actors in commons-like frameworks, and we use this as a direction for 'commons design'.

UNDERSTANDING COMMONS
The interdisciplinary research of commons is rooted in the study of shared natural resources and communities around them. Commons are often described as "shared resources that are vulnerable to social dilemmas" (Hess & Ostrom 2007). Potential problems – social dilemmas – of traditional commons are often located in the use and especially the overuse/overconsumption of shared resources. Hardin (1968), in his paramount essay 'The Tragedy of the Commons', claimed that freedom of commons leads to neglect and overconsumption and eventually ruins shared resources. Contemporary commons scholars have offered counter narratives and empirically grounded evidence of the existence of social trust and collaboration that can overcome the "tragedy" scenario (Hess & Ostrom 2007; Benkler 2013).

In the commons literature it has often been necessary to highlight the difference between a commons as a resource or resource system (a.k.a. common-pool resources, CPR), and a commons as a property-rights regime (e.g. legal regime). In other words, the question is whether use of the resource is open for all (e.g. public goods) or limited to a pre-defined group (e.g. club model).

Broadly speaking, it is possible to identify three different approaches to the commons: 1) The first one is the *traditional commons* research that mainly focusses on understanding the role that institutional arrangements play in sustaining and managing shared natural resources in various sectors, such as agricultural production systems, floristries and fisheries (Ostrom 1990). The empirical studies on commons demonstrate that people themselves are able to create, govern and sustain natural resource commons despite their social dilemmas. This existing body of knowledge points to and analyses

PDC'14, 06-OCT-2014, Windhoek, Namibia.

patterns and practices of collective action by identifying other forms of organising besides the market or the state.

2) A second strand of research focussing on the *new commons*, also referred to as the knowledge/information commons, emerged in the mid-1990s alongside the materialisation of intangible commons that is characterised by the networked society and especially visible on the Internet (Hess 2008; Hess & Ostrom 2007). There is an abundance of legal literature on commons that discusses the forms of public/common goods and their "open commons" nature, arguing that everybody should have equal rights to use and partake in governing the resources (Lessig 2001; Benkler 2006; Benkler 2013). New and open commons are mostly intangible and cumulative resources, such as knowledge and digital resources, which are not depleted by rivalry or overconsumption. Here, open collective actions initiatives relying on shared resources (e.g. open access, open source, commons-based peer production) and new forms of enclosure (e.g. digital rights management, intellectual property regimes and licensing strategies) form most of the empirical examples. This body of knowledge provides insights into the role of a variety of infrastructures in the digital networked society that by design can enclose or open these commons.

3) A recent strand of commons can be identified as the *activist/practitioner movement*, which treats commons as a vehicle for social change and democratic governance (e.g. Helfrich & Bollier 2012; Bauwens 2009). Here, commons are seen not as shared resources but rather as a relational quality that depends on actions and decisions taken by a group of people (Helfrich & Bollier 2012, Bollier 2014). An important focus of this strand is to identify alternative means for the provisioning and governance of commons, i.e. means that go beyond the market or the state. The rise of this movement is also seen as a reaction against the growing privatisation and commodification of public/common goods (Hess 2008). This strand focusses more on the *process* (how to create commons, how to sustain and govern them, etc.). Commons activists are not only advocating open access to shared resources; they are also interested in developing partnerships and educating people to *be part* of these processes (see e.g. Pór 2012). Important insights to take away from the practitioners' accounts are connected to the ways in which to make the patterns and practices within commons visible and accessible for others. In addition, activist thinking provides reflections on the roles of the participants – both professional designers and other stakeholders – in commons-like frameworks that operate in an iterative open-ended process rather than in a specific project.

PD PRINCIPLES FOR SUCCESSFUL COMMONS?

It is a common practice in PD to communicate practical knowledge in the form of articulated principles and strategies for designing. The knowledge obtained in practice (e.g. through projects) is reflected and shared within the community – not as "recipes for success" but rather as anchors that are useful as thinking guidelines when immersed in practical design work. Classical examples include Greenbaum & Kyng (1991) and Schuler & Namioka (1993). These examples expertly condense guidance and strategies for workplace interventions and for articulating work with identified organisations. As PD is increasingly concerned with providing spaces or platforms for participation, communication and collaboration in broader terms and also for unidentifiable collectives (Björgvinsson et al. 2010; Botero & Hyysalo 2013), there is a growing need to update and extend those principles and practices to new realities.

An interesting point of departure to tackle this new challenge can be research on the traditional commons. In her seminal work, Ostrom (1990) conducted a meta-analysis of 86 case studies of small- and medium-scale natural resource commons. Through these case studies, she identified eight 'design principles' for long-enduring commons. She did not intend them as "recipes" to create new commons. For her, the design principles refer to certain sets of essential elements or conditions that account for the 'success of institutional arrangements in sustaining a particular common-pool resource (CPR) and gaining the compliance of generations after generations' (Ostrom 1990, 90). According to Ostrom, long-enduring CPR commons are characterised by strong collective action made possible by things such as clearly defined rules and boundaries that community members have the right to devise and revise; the presence of mechanisms for self-governance, monitoring and conflict resolution; and nested structures to guide use, appropriation and provision (Ostrom 1990; Hess & Ostrom 2007).

One key finding of commons research is that 'an extremely rich variety of specific rules were used in systems sustainable over a long time period', where the rules are well matched to local needs and conditions (Hess & Ostrom 2007, 7). These factors are also becoming crucial for PD as new technological possibilities increase the prospects for people to 1) collaborate, create and share common resources and 2) take part in design activities earlier monopolised by professional designers and other established actors.

Although these design principles were not intended to provide a model for designing a commons, they can help PD to develop a more nuanced understanding of design agency and its interplay with multiple mechanisms of collective action. In PD we might need to look at, understand and engage collectively in processes distributed more radically in space and time and within more complex socio-material assemblies than what has been done previously. How are *processes* of self-governance, management and provision designed? How can the *rules* and *practices* for cooperation and use of shared resources be co-designed in fair, inclusive and sustainable ways?

Infrastructuring for Commons?

One important line of work in PD that could easily link to work on commons is 'infrastructuring'. Infrastructuring proposes that PD takes as a starting point previous work around the growing importance of information infrastructures as an integral part of contemporary life. An important reference point has been Star & Ruhleder's (1996; also Star & Bowker 2002) proposition of

infrastructure not as some substrate that disappears – something that is built and left behind – but as something that only makes sense and is meaningful for someone within a particular practice. Infrastructures, including physical and institutional structures, affect how commons can be utilised (Hess & Ostrom 2007, p. 68). They also have a critical role in framing how commons are managed (Frischmann 2012).

Given such positioning, how do we infrastructure? Star and Bowker (2002) suggest that what should be taken into consideration with infrastructuring is 'when' something is being perceived as an infrastructure by its users rather than 'what' an infrastructure is. While most design approaches tend to focus on particular artefacts, neglecting – more or less – the surroundings in which the artefacts are placed, it is precisely these surroundings that become a concern for infrastructuring (Pipek & Wulf 2009). Accordingly, when doing infrastructuring, a lot of design work turns towards a continuous alignment between contexts and the ways in which agency is socially achieved (Björgvinsson et al. 2010/2012a/2012b, Seravalli 2012; Lindström & Ståhl 2014). From this point of view, infrastructuring becomes an engagement in experimenting with ways of achieving this alignment (Hillgren et al. 2011; Pipek & Wulf 2009) while accounting for the creative 'design' activities of professional designers and users across the divide and beyond technology (Karasti & Syrjänen 2004, Pipek & Syrjänen 2006) without necessarily privileging either view.

Can we see the ways in which contemporary PD infrastructuring processes are (or can be) a type of "design commons"? That is, are they processes that are structured in particular ways of doing and managing design contributions where contributors are not just designers, users or producers but start to resemble a collective of commoners?

Commoning as Designing?

If commons are seen as a vehicle for change (Bollier 2014), a new vocabulary for actors within the commons is needed. Despite the professions or skills in the activist-driven commons movement, participants are often addressed as *commoners,* described through the act of 'commoning'. The term 'commoning' was initially coined by historian Peter Linebaugh (2009) in an attempt to portray aspects of the commons that are linked with activities, not just with the more widespread understanding that sees commons as material resources (i.e. traditional commons research).

Commoning is being advocated as a way of providing a new and needed vocabulary to make visible both "the social practices and traditions that enable people to discover, innovate and negotiate new ways of doing things for themselves" (Bollier & Helfrich 2012). On the other hand, commoning has also been explained as a design activity and "creating a commons culture" in partnership with other actors (Pór 2012). Commoning thus emphasises the active nature of the commons and the commoners that are taking part in the creation and maintaining of local and global commons. It also highlights the notion that commons can *only* be managed through social relationships and shared knowledge (Bollier 2014).

The activist commons movement can provide inspiration for PD to rethink our practices and roles. PD has a longstanding interest in supporting people to design for themselves. However, the question is, are we ready to reconsider our *designer role* when operating in commons-like frameworks, and can we see ourselves as co-designing commons with other commoners?

PD is moving beyond software projects towards more fluid configurations and collaboration. For this, the commons literature could also offer insights from already-conducted empirical work.

CONCLUSIONS

People construct commons every day and everywhere in their efforts to share resources and tackle common problems in our societies. As discussed in this article, this poses a challenge for professional designers, asking us to think about how we can design better infrastructures and frameworks that enable, mediate and foster the emerging and increasingly complex 'commoning practices'.

This brief overview shows that the commons discourse has many connections with PD. The first one refers to a shared democratic political agenda. PD's interest in democratisation (Ehn & Kyng 1987; Greenbaum & Kyng 1991) is also fundamental to commons-related studies. By linking PD endeavours to commons frameworks, we could link our efforts to knowledge production, sustainability and resilience on a broader scale than just technology development.

Both PD and commons literatures build upon stakeholders and communities' capabilities and right to act and decide upon their future. Both PD and commons studies discuss the potentials and dilemmas of collective action (using different vocabulary) and its infrastructuring needs. Insights from commons research can offer much more elaborate notions about why, how and under what conditions people do things together, and not only how we seek or are invited to 'participate'.

Furthermore, scholars writing on commons have already tackled some of the issues that are now also becoming relevant for PD, such as questions related to intellectual property (IP) and matters related to (distributed and shared) ownership. We suggest that we, the PD community, should turn more seriously to the implications coming from the contemporary commons literature to ensure the relevance of PD in the future.

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From Rules in Use to Culture in Use – Commoning and Infrastructuring Practices in an Open Cultural Movement

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Abstract: This paper explores how design and commoning practices can contribute to sustaining open cultural commons and guarding against enclosure. Based on a long-term engagement with a cultural movement, the author examines how design activities can strengthen interaction and participation in commons-like frameworks, and describes commoning and instrastructuring practices that can support commons culture. By critically reflecting on the development of a local Finnish chapter of the OpenGLAM (Galleries, Libraries, Archives and Museums) movement, the paper contributes to the ongoing discussion of design as infrastructuring in complex and open-ended socio-technical settings.

Keywords: Commons, Commoning, Culture, Infrastructuring

1. Introduction

Digitalization has affected nearly all aspects of our society, albeit in different ways. For cultural and memory institutions, it has created enormous potential to expand public access to their (digital) holdings and establish and renew collaborative relationships with visitors. Along with the digitizing of cultural heritage, new digital tools are also creating novel ways for people to access, appropriate and reinvent culture. Despite these developments, cultural and memory institutions are not providing as much access as they could to their digitized collections (Bellini, et al. 2014), nor are they creating good conditions for people's creative re-use activities (Terras, 2015). For some commentators, this situation is turning into the enclosing of important parts of our cultural heritage (cf. Boyle, 2009; Hyde, 2010). This enclosing has been viewed as stemming from reasons that range from conflicting intellectual property rights, a lack of resources and knowledge inside organizations, to an unwillingness to share authority or control over their digital cultural heritage and even the fear of losing

possible revenue opportunities (Verwayen, et al. 2011). The international OpenGLAM movement aims to assist galleries, libraries, archives and museums in identifying these challenges, raising awareness and finding ways to provide open access to their digital cultural heritage. In this article, I study the case of a local chapter of the OpenGLAM movement (AvoinGLAM) and its journey toward fostering the emergence of a more diverse cultural commons in Finland, by documenting and reflecting upon some of the commoning attempts of this network and related design practices.

The work presented here builds on traditions that see design as an open and collective process of designing practices together – in particular, recent thinking that draws on conceptual tools surrounding the concept of the commons – to better understand new modes of participation, production and designing. The relationship between commons and design has been used to investigate collaborative creation and production (Elzenbaumer, 2014; Björgvinsson, 2014; Seravalli, 2014) and has been used as a useful device for informing new discourses of participation in contemporary settings (Marttila, et al. 2014; Teli, 2015). The work is also linked to insights from community-based participatory design research that has identified a need for understanding the implications of new forms of politics and practices (DiSalvo, et al. 2012; Le Dantec & DiSalvo, 2013; Björgvinsson, et al. 2010/2012; Hillgren, et al. 2011) that see design as concerned with infrastructuring. This paper thus contributes to the discussion on commoning and infrastructuring in Participatory Design by bringing insights and findings from the experiences of a value-driven cultural movement. The paper highlights the complexity of infrastructuring cultural commoning activities and shows how questions of ownership and the use of common resources are not only impacted by rules and regulations but also by cultures surrounding the infrastructures. It looks into the strategies of ongoing infrastructuring and how they aim to support and nurture cultural commoning activities, as well as the process of becoming of the open cultural commons in Finland.

The empirical material is based on long-term engagement (four years), action research (e.g., interviews with key actors/organizations, designing and organizing workshops, hackathons and other activities of the network) and personal reflections on these experiences. In analyzing the materials, I ask: What kinds of design principles, practices and commoning activities contribute to the co-designing, building and sustaining of open cultural commons?

The article begins by briefly introducing the concept of *cultural commons* and *commoning*, followed by a description of the case. Thereafter, I analyze the everyday commoning practices of the movement and the *design as infrastructuring* activities as they occurred within the movement. I conclude with a discussion on the importance of culture to creating commons.

2. Cultural Commons and Commoning

Commons-related research has a long and established interdisciplinary tradition, and it has branched out in many directions from its roots in the study of shared natural resources and

the communities around them (see e.g., Ostrom, 1990; Hess, 2008). Commons are often simply described as shared resources in which all parties have an equal interest and that are vulnerable to social dilemmas (Ostrom, 1990; Hess & Ostrom, 2007). Potential problems are located often in the use and especially in the over-use of shared resources, and in issues of free riding and vandalism (Hardin, 1968). In a seminal study, Ostrom (1990) analyzed more than 80 case studies of small- or medium-scale natural resource commons and identified eight "design principles" that were present in cases of long-enduring and robust commons. These principles included aspects of monitoring and collective-choice agreement (Ostrom, 1990). One of the key findings of this research tradition is that a rich and very specific set of rules has been in use in resilient commons over a long period of time, and the rules were well matched to local needs and conditions, as well as respected by surrounding authorities (Hess & Ostrom, 2007, p.7).

Since scholars began to study the "information commons" and the "knowledge commons" in the digital age, there has been increasing interest in understanding what commons could mean in other environments, such as that of cultural production (cf. Hess, 2008; Hess 2012; Madison, et al. 2010; Bertacchini, et al. 2012; Björgvinsson, 2014). Such "new commons" refer often to intangible and cumulative resources, such as knowledge pools and digital resources, which are not depleted by rivalry or overconsumption, and commons arrangements to overcome social dilemmas (Hess & Ostrom, 2007). Knowledge commons are sometimes used to refer to "institutionalized community governance of the sharing, in some cases, creation, of information, science, knowledge, data, and other types of intellectual and cultural resources" (Frischmann, et al. 2014). The renewed interest in commons among scholars and practitioners emerged due to an increased threat of the commodification of culture and knowledge resources, as well as social problems and conflicts related to online resources and networks (Hess, 2012).

In general, cultural commons have been referred to as cultures expressed and shared by a community, and as evolutions of cultures as a form of shared resources (Bertacchini, et al. 2012.) Cultural commons have also become a favored concept for discussing the phenomena of everyday people taking part in the processes and practices of culture institutions (e.g., crowdsourcing practices, see, e.g., Ridge, 2014) and as a device for pursuing change (Edson, 2015). While culture commons are indeed quite broad, in this paper, I will mostly focus on the cultural resources that cultural and memory institutions are responsible for preserving and creating access to, and the practices related to them. Nevertheless, I understand "cultural commons" to be evolving commons, cumulative in nature, where various positioned groups and individuals negotiate the value, creation, use and governance of diverse cultural resources. These participatory cultures not only shape our common cultural heritage and memory but also create knowledge commons and common-pool resources. It is important to notice that the discussion on cultural commons that are tangible (e.g., collections of museums) has mostly revolved around the moral and legal ownership(s) of

cultural heritage artifacts (Bruncevic, 2014; Bertacchini, et al. 2012), focusing on the appropriation and enclosure of cultural sites. In relation to digital cultural commons, a threat of enclosure arises not from the overconsumption of tangible cultural heritage artifacts but rather from debates over who has the rights – moral and legal – to access and use these resources (cf. Boyle, 2009; Hyde, 2010; Benkler, 2013). The questions of ownership in connection to digital cultural commons have spawned debates on two fronts: (a) What should be preserved in digital form, and (b) who can access and use it, and under which terms (i.e., copyrights, Digital Rights Management systems) (e.g., Marttila & Hyyppä, 2014b). These two questions are at the heart of the work of AvoinGLAM, to which I will return later.

The people managing commons or being part of a commons movement are often addressed as "commoners", recently described through the act of "commoning" – a term used to point to contemporary efforts to create a "commons culture" sustained by partnerships between actors (Pór, 2012). In short, commoning can be described as an ongoing collective action for meeting shared goals and needs (Bollier & Helfrich, 2015). It emphasizes the active nature of commons and the presence of active commoners who are taking part in the creation and maintaining of local and global commons. Initially, the term was coined as an attempt to highlight people's activities connected to commons, rather than addressing commons only as a resource (Linebaugh, 2009). Hence, the concept of commoning highlights the idea that commons can be governed only through active social relationships; it foregrounds the social practices, traditions and rituals linked to commons (Bollier, 2014; Bollier & Helfrich, 2012). Bollier and Helfrich (2015) even stipulated that in order to understand or build any theoretical frameworks on commons, one has to "enter into a deep and ongoing engagement with the everyday practices and experiences of commoning." I will follow this invitation through a personal reflection on the AvoinGLAM movement, which I present next.

3. Open Culture and AvoinGLAM

The term "free culture" is a key element of Lawrence Lessig's (2004) thinking on the rise of the digital information society and the digitalization of our everyday life. It describes how people increasingly create new, collaboratively produced cultural artifacts by building upon found content online. One of the key arguments of Lessig's books (2001/2004) was that current intellectual property laws threaten to suffocate creativity and make people's everyday media remix and sharing practices illegal. Instead of free culture, Lessig contends that we live in a "permission culture," in which people can only design and create new cultural artifacts with permission from authors from the past. The Creative Commons initiative was built on this insight; it offers a design infrastructure in the form of a licensing framework and tools that can enable people to share their works with more flexible terms than that of the existing copyright regime. Creative Commons introduced a set of predefined rules for global cultural commons, which are now applied to more than 1 billion works (Creative Commons, 2015).

Coinciding with this development, large digitalization and conservation projects run by cultural and memory institutions have formed and made large digital collections of our shared culture and history available. Unfortunately, in most cases, these digital vaults are not made available or accessible to the general public, even when the copyrights of the original artworks and cultural artifacts have expired. The idea of the OpenGLAM was born against this backdrop (see also Baltussen, et al. 2013). It later became an initiative of the Open Knowledge Foundation (now Open Knowledge, OK), which "promotes free and open access to digital cultural heritage held by Galleries, Libraries, Archives and Museums."[1] Soon after, actors in different countries founded local chapters focusing on local stakeholders and institutions. One of these is AvoinGLAM, which was founded in Finland in the spring of 2012. The mission of AvoinGLAM is to support cultural and memory institutions to open up data and content, and develop more open and transparent work practices and organizational cultures. Furthermore, AvoinGLAM promotes meaningful public access to open cultural content and stimulates the re-use of these digital cultural heritage artifacts.[2]

During the past four years, the AvoinGLAM initiative and network has evolved and organized different activities, events and projects. By now, the participants of the network are impossible to count, as, e.g., we do not have a membership policy, nor do we track the people who have participated in our events.[3] The following schema presents selected commoning key efforts in a linear continuum: foundation building, creating a shared knowledge base and resources, framing conditions for creative re-use, and fostering and sustaining cultural commons. At the same time, while delivering a descriptive account of the case, I aim to draw attention to some of the design activities undertaken in this process of co-designing commons.

3.1 Building Foundations

AvoinGLAM was officially launched in an event titled "Towards Open Culture and Art" targeted to Finnish culture and memory institutions in August 2012. In addition to the launch of the initiative, the event served as a platform by which to collectively map and understand the current state of activities and projects related to open culture in Finland, and for

[1] OpenGLAM is also a global network (not limited to its institutionalization in OK) of people and organizations aiming to open up content and data held by GLAM institutions. In addition, OpenGLAM has a working group that is advised by an international group of experts. The publicly most known and visible parts of the movement are the active OpenGLAM mailing list and openglam.org.

[2] At the beginning, AvoinGLAM was a project of Aalto ARTS, Media Lab that branched out to a small group of likeminded people working with the same themes (Salgado & Marttila 2013; Marttila & Sillanpää 2014). Later, when the Open Knowledge Finland association was founded in 2013, AvoinGLAM became a thematic working group of the association. Yet close ties to the university have remained. Initiating AvoinGLAM in the university was a conscious choice for ideological and practical reasons: universities, as organizations, (should) represent the idea of free and open knowledge; for me, as the founder, it was important that the initiative not be tied only to a person but also to an institution. On the practical side, since I worked in the university, I was able to secure some seed funding to establish the initial social and technical infrastructure upon which to build the group.

[3] Some indication of the Finnish network is the amount of members in the AvoinGLAM Facebook group. In March 2016, there were over 320 people in the public group.

institutions to bring forward their challenges and obstacles in opening their digital holdings for a wider public. The event was designed by me and the core team in two parts: first, introductory presentations on what could be understood as open culture and open cultural data, and second, a co-design workshop for the network, in which participants would go through five different assignments in groups, – e.g., mapping the "levels of openness and participation" of the organization they represented, or discussing the practical application of "principles of openness." These five assignments included diagrams (framework drawings) and a set of step-by-step written guidance questions.

Picture 1 Participants of the Towards Open Culture and Art workshop thinking together about how to build an accessible and open cultural heritage institution.

After this event, similar workshops were organized in six different cities in Finland that brought together representatives from local libraries, archives and museums. Workshops were organized in collaboration with a local cultural institution, and often by invitation from the local partner.

Several findings were made by staging workshops and seminars to co-construct shared language and understanding, and lay the foundations for open cultural commons in Finland: Actors across the cultural domains (e.g., libraries and archives) identified similar challenges and obstacles. Firstly, there was a lack of awareness and strategies for intellectual property rights. Most organizations do not hold the copyrights to their collections, and obtaining the rights is laborious and expensive. Secondly, there is a lack of knowledge, skills and experiences related to digital technologies and open data. Many organizations lacked in-house competences, and often the digital platforms, tools and services in use had been outsourced to a third party, preventing small-scale pilots and experiments from taking place

within the organization and inhibiting organizational learning. Thirdly, the organizational support and organizational cultures that are conductive for open cultural practices were lacking. The workshop participants felt that their organizations' current work practices and processes did not support openness and/or opening content and data. Change would be needed, both in the organizations' practices and in their employees' work roles and tasks (see Salgado & Marttila, 2013, for a more elaborated account of the findings). Fourthly, there was surprisingly little collaboration between actors and sectors – even if the involved cultural institutions were physically located next to each other. This led to the conclusions collaboration needs to be strengthened in the Finnish cultural sector and that a network that is not domain specific (e.g., for libraries or for archives) but reaches across existing domains and their specialized professional organizations will be able to build a platform for commoning that would enable collective learning and sharing.

These findings became a cornerstone of the AvoinGLAM work and guided my personal design and commoning activities in the working group, projects and movement.

3.2 Creating a Shared Knowledge Base and Common Resources

Since there was a great need to increase the level of knowledge and skills regarding open cultural data and content, as well as to gain more experience with novel digital technologies and services, the network decided to train itself. Inspired by a Dutch master class concept,[4] AvoinGLAM organized a 5-month course on mastering issues surrounding open culture and data, and on learning and exploring, in practice, how to open-up a portion of their collection for a broader public. Over 20 participants from different GLAM institutions throughout Finland took part in the course. The participating organizations released cultural data and/or content, and made it available either under a Creative Commons license or under Public Domain Mark. This project also produced an online course on P2P University[5] and a guidebook (Marttila & Sillanpää, 2014) on how to open up cultural data and content. The main focus, however, was to provide a structured means for sharing principles and knowledge about how a GLAM institution can be more open, a checklist for opening data and for mapping an organization's current and future activities.

[4] The Open Cultuur Data network was established in September 2011, and the first master class followed the next year. More information can be found on www.opencultuurdata.nl.
[5] The course can be accessed at https://courses.p2pu.org/en/courses/2641/content/5710/.

Picture 2 The Open Cultural Data Master Class participants met once a month for contact teaching and collaborative work. In addition, the master class had a field trip to London to learn from pioneering OpenGLAM organizations. Here, the participants are imagining creative re-use scenarios in the British Library.

Producing a master class, as a funded project of AvoinGLAM, changed the dynamics of the movement and required careful consideration about how to govern and manage different activities. It was also the first time that people were hired for AvoinGLAM and for the Open Knowledge Finland (OKFFI) association. As the person responsible for the project's design, I also became accountable for its execution. The key challenges here were how to balance the paid work and the so-called voluntary activist work and determining what kind of mechanisms to implement to ensure a fair and sustainable movement. Some structures were implemented: OKFFI adopted a policy of open/public budgets and plans for its projects; also, a same-salary principle was implemented for the AvoinGLAM projects to ensure and communicate to the movement that all skills and work efforts are appreciated and valued equally.

3.3 Framing Conditions for Creative Re-Use

The master class was a success by many accounts, as the participants and their organizations produced common pools of open cultural data and content. They also gained know-how and shared knowledge in the process. Yet the AvoinGLAM movement still lacked good local examples of the benefits of opening data, or of how people could use the new resources. To produce these examples, we developed an initiative, Hack4FI, to increase the creative re-use of open digital cultural data. Hack4FI – Hack your heritage! branched out from the Danish initiative Hack4DK and followed the same guiding principles as the original one, but adapted

them to the local conditions. The Hack4FI – Hack your heritage! hackathon was organized in February 2015, and more than 50 people engaged in appropriating Finnish open digital cultural heritage over a weekend. This diverse group of coders, designers, artists and representatives from cultural heritage institutions produced more than 20 concepts, mock-ups and prototypes – both digital and tangible ones – and had six weeks to finalize their works and submit them the Hack4FI competition. The process ended with a gala, during which the final works were presented to the public and awarded by a jury of experts.

Picture 3 The first Hack4FI – Hack your heritage! hackathon brought together a diverse group of creative minds to design and develop new cultural works by re-using open digital cultural heritage.

From my perspective as a designer, the hackathon was aimed at creating conditions for fruitful collaboration, exchange of ideas, knowledge and networking. To aid this, the collaborative infrastructural design repertoire included an analogue people's wall, collaborative documents for shared notes, project documentation and presentations. These commonly created and cumulative resources were made publicly available online. The hackathon was designed to have multiple tracks, with each track having a preselected facilitator who could freely organize its work and schedule. However, the participants also had the freedom to organize themselves around a question, theme or project. Most of the participants did not choose a track but instead formed groups organically that were guided

by a shared interest. The overall frame of the hackathon was intentionally designed to be loose and open, giving the participants the freedom to familiarize themselves with the themes, the open data and content made available and the other members, as well as to form groups and develop ideas together.

3.4 Sustaining and Scaling Commons

The AvoinGLAM movement has grown in size and contributed its share, to the point that today a majority of Finnish cultural heritage institutions have some initiative aimed at opening up their digital collections to the public or are planning to do so (OpenGLAM Benchmark Study, 2015; Sillanpää, 2015). Importantly, the movement has scaled from being a working group toward becoming a vibrant and distributed movement, with multiple actors that have various objectives and motivations. We have moved from a collection of institutional arrangements for common-pool resources to a cultural commons with recognition and acknowledgement in Finland.[6] However, needless to say, the AvoinGLAM movement has faced many similar social dilemmas as other many initiatives operating in similar settings. Issues such as voluntary/paid efforts are recurring, especially in the context of contributions that require a long-term commitment or are considered dull and laborious (e.g., reports, surveys), resulting in the same people often doing the heavy lifting. Another problem is commercial appropriation, where third parties republish the open content released by GLAM institutions and claim rights to them. Currently, the sustainability strategy of AvoinGLAM is to advocate for a national open-culture policy for cultural heritage institutions in Finland that would give guidelines and recommendations for a licensing framework, accessibility and so forth.

4. Design as Infrastructuring

Information infrastructures have a fundamental role in our contemporary life (Star & Ruhleder, 1996) and naturally also affect how commons can be managed and used. These infrastructures include the multiple layers of social, material, technical and political structures in our societies. Seeing design as infrastructuring (Karasti & Syrjänen, 2004; Karasti & Baker, 2004) has stemmed from the importance of drawing attention not to *what* an infrastructure is but *when* and *how* infrastructures become and for whom (Star & Ruhleder 1995, see also Star & Bowker, 2006; Ehn 2008; Karasti 2014). Design as infrastructuring has been used as a strategy for forming publics (DiSalvo, 2009; Le Dantec & DiSalvo, 2013; Lindström & Ståhl, 2014) and supporting movements through participatory design (Björgvinsson, et al. 2010/2012; DiSalvo, et al. 2012;). Björgvinsson connects infrastructuring and cultural commons, and points out that the approaches share the relationship between local needs and global or shared needs, as well as the issues of

[6] For example, the Open Cultural Data Master Class received the honorary prize “Archive Act of the Year” 2014, and AvoinGLAM has received funding from the Finnish Ministry of Culture and Education.

governance and negotiating agreements (Björgvinsson, 2014, p.191). This body of scholarly work provides a good point of departure for understanding the need for infrastructuring in commons-like frameworks. (Due to the limits of the article format, these debates are not closely reviewed or elaborated here; for an excellent overview grounded in Participatory Design, see Karasti, 2014).

The concept of "infrastucturing commons" has been linked to collaborative and open modes of design and cultural production, and to how infrastructuring in explorative socio-technical environments requires new ways of thinking, designing and commoning (Marttila, et al. 2014; Björgvinsson, 2014; Seravalli, 2014). Informed by my experiences with AvoinGlam, I will now illustrate what kind of commoning and infrastructuring activities happened and contributed to the open cultural commons. Commons in the cultural realm naturally consist of diverse interrelated infrastructures: everything from IT infrastructures to legal frameworks, cultural heritage systems, social practices and shared resources. For the purposes of the paper, I will focus on commoning practices and efforts of infrastructuring these in relation to three different types of shared and collaboratively produced common-pool resources (CPRs).

4.1 From Common-Pool Resources to Commons

Three common-pool resources (CPRs) – digital collections, shared knowledge and networks – are especially interesting in connection with building an open cultural commons in Finland. The commoning practices associated with these CPRs became sites where co-design activities took place, allowing me to reflect on the co-designing of open cultural commons, the role of designers in the infrastructuring activities and the tensions that arise in commoning activities and that foreground social dilemmas and power relations.

1. **The open digital collection of cultural heritage and data**.
   This common-pool resource, a digitized inventory, can be seen as a distributed repository of content and data that is released by cultural and memory institutions. These resources are managed and governed by many different stakeholders, e.g., the institutions themselves, the so-called users (e.g., designers, developers, researchers, artists and educators) of the digital content and the administrators of the platforms upon which these commons and commoning activities rely. These collaborative commoning activities vary from management to use and to creative activities, e.g., the social enrichment of metadata, which can be voluntary (rating, adding comments, descriptions) or involuntary (e.g., use statistics, system data), or the "creative re-use" of content (Marttila & Hyyppä 2014a) (cf. also Botero, et al. 2010). Each of the digital repositories and social platforms has its own rules in place (e.g., licenses, terms-of-use, community guidelines) in addition to laws and regulations (e.g., copyrights, privacy laws). Often, people in cultural digital

commons engage in so-called “everyday resistance” (an original term coined by Scott (1985) to describe forms of cultural resistance and non-cooperation), e.g., ignoring copyright and license requirements, or providing the wrong personal information. These acts seem to stem from people’s moral and political considerations; although they are actively engaged in the digital cultural commons, they have not been allowed to take part in producing the rules according to which, e.g., copyrights or digital platforms function.

2. **The reservoir of shared, collaboratively produced knowledge.**
Engaged people with a shared interest in the cultural commons form a knowledge base through, e.g., sharing stories, experiences, examples, tools and ways of addressing recurring problems. In the beginning of AvoinGLAM, people from the cultural and memory institutions often asked for “good examples” and cases of re-use of open content/data, or scenarios describing what value opening up would bring to the institutions, its user groups and to society at large. Two online groups were set up to nurture the sharing practices (the public AvoinGLAM Facebook group and the closed Google+ group for the Open Cultural Data Master Class). These groups quickly developed practices for sharing and accumulating knowledge among the participants, replacing help requests to a central node by a shared pool of knowledge. Shared guidelines, principles and good practices rapidly became a backbone for the local and international movement, and extended into the public as discussions marked as #AvoinGLAM/#OpenGLAM on social media.

   Commoning activities in the digital open cultural commons are not always as simple as nurturing the sharing of posts on social networking sites. In AvoinGLAM, participation often required skills and practices that were foreign to many of the actors involved, such as the collaborative asynchronous writing/editing of online documents (through, e.g., Etherpad or shared Google documents) and the practice of sharing unfinished outputs publicly with peers and professional networks, which was often very different from organizational practices. In order to participate in the co-construction of the cultural commons and benefit from the common-pool resources, some people had to quickly adopt an entirely new working culture, adopt new technological tools and be convinced that an attitude of openness could benefit their work.

   In the international OpenGLAM working group, we initiated a process to share our ideas, visions and knowledge by collectively producing OpenGLAM’s principles. Our aim was to provide a statement describing the OpenGLAM organization and, at the same time, provide criteria against which organizations could map their activities. Even if commoning activities could be

guided by commoners' moral compasses, our experience was that both organizations and commoners needed principles and definitions to align their activities with others in the movement, as well as a shared vocabulary and knowledge base to talk about the directions of their moral compass. In addition, shared resources for various projects and open collections were compiled and maintained on the openglam.org website.

As cultural practices become an element of open-ended design interventions, the use of language should not be overlooked in creating and sustaining commons-like frameworks. In both AvoinGLAM and OpenGLAM, we aimed to construct a shared language and create a set of shared understandings precisely through collectively defined terms that I thought to be relevant for the movement (e.g., What do we mean by openness? What is open cultural data/open content?) to build upon the Open Definition (opendefinition.org), which was developed in an open, collaborative process, published and maintained online by Open Knowledge.

3. **The community as commons.**
The knowledge, skills and practices of people in the movement form a dynamic resource that the movement lives from and can tap into. As an example, when a member of the network has a problem or needs help, she can pose the question on the public Facebook group to seek an answer or guidance. Even if tied to a specific time and people, such discussions are archived and can be accessed later. In a way, the network becomes a commons. In the feedback interviews with the participants of the Open Cultural Data Master Class, most of the interviewed participants (17/20) stated that the most influential and important part of the course was the community of people that was forming in the course. In parallel to the course, many of the participants self-organized Wikipedia courses in their organizations and held meet-ups with peers.

Close community ties, friendships and tight collaborations, however, might also have a negative effect on the movement's sustainability and scalability. Literature on "communities of practice" has shown that people who engage in a collective process of learning and knowledge exchange develop a shared language, shared procedures and conventions that make it difficult for people outside the community to join (Lave & Wenger, 1991). Language is the key to constructing network power relationships and is thus important for the non-hierarchical aims of open culture movements. Values, morals and attitudes are communicated through rhetoric and are embedded into people's

everyday practices. To give a mundane example, the working group chose not to have "leaders" but "contact persons" in order to communicate and institute flat hierarchy structures and to encourage spontaneous, self-organized groupings or clusters. This practice, however, became unsustainable when AvoinGLAM took on externally funded projects and was invited to take part in policy work or to represent the network in more formal settings (e.g., steering groups).

4. Concluding Remarks

Commons are often seen as governed and managed through a set of rules-in-use. Rather than explicitly defined and stated, these rules tend to arise from social practices and interactions among people – this is one of the key design principles of robust and sustainable commons (Ostrom, 1990). In the cultural environment, commoning activities and cultural practices increasingly rely on digital platforms and social networking sites governed by often commercially motivated rules and laws that commoners have not been able to negotiate themselves (cf. Marttila & Hyyppä, 2014b). Therefore, they are not always well matched to local needs and conditions, and are aimed at sustaining profits rather than sustaining viable commons. To give a concrete example, many Finnish cultural institutes released parts of their digital collections onto Flickr – the image and video hosting website – and often, if the copyrights permitted, on the Flickr Commons. After releasing this open/no-known-copyrights cultural heritage, some institutions[7] realized that third actors were selling the released pictures on another Web service, illegally claiming rights to these images. Despite institutions' requests for these pictures to be taken down from online shops, the practice of watermarking and selling photographs continues. Related to this, dilemmas occur when commoning takes place on commercial online platforms. Most of AvoinGLAM's online activities happen on Google services and Facebook, which means that locally created and nurtured cultural commons are subjected to the commercial interests of these corporations. Furthermore, the practices of these corporations create tensions between commoning practices toward open cultural commons and corporations' commodification of culture and citizen engagement (such as by generating use data) (Kitchin, 2016). This creates a dilemma when working to build robust open cultural commons: one of the key design principles – that those who are affected by the rules should be able to participate in modifying them – is thus beyond what commoners can influence, if they choose to use digital collaboration tools. This forces the actors in cultural commons to seek alternative measures for sharing and

[7] For example The Society of Swedish Literature in Finland and the Gallen-Kallela Museum have reported on the public AvoinGLAM Facebook group that the photographs they have released on Flickr could be purchased on stock photo web services Alamy.com.

boundary setting.

Blomley (2014) has argued that commons do not have to be governed through rules, but can be "a moral and political commons, justified and enacted through a *language* of rights and justice" (p.318, my emphasis). People's moral compasses often guide their commoning activities, as described by the concepts of "matters of concern" (Latour, 2004) and "matters of care" (Puig de la Bellacasa, 2011). This concern and care include, as we have seen, activities to circumvent or set aside rules and regulations. In this way, the legal commoning question is also a political and moral question, namely: who has the rights to our common culture? This question cannot only be answered in the abstract but needs to be answered in daily practice, including language practice. In the AvoinGLAM case study, it becomes evident that organizations and commoners need guiding principles and definitions, as well as common commoning language and practices, which they can use to align their current and future activities and negotiate the internal as well as external (legal and commercial) pressures that work toward enclosure.

This paper has interrogated which commoning activities and infrastructuring design principles and practices played a role in creating a movement towards open cultural commons that seems to be sustainable. Based on my analysis of the AvoinGLAM case I propose that in co-design and commoning processes of open cultural commons, we should work through infrastructuring a "commons culture," rather than mainly through designing legal and regulatory or technology infrastructures (e.g. licensing frameworks, Web hosting services). Building commoning principles, vocabularies and ideals that actors (organizations and individuals) can use to define their identities can be complementary to setting rules that external authorities would respect. As this paper has shown, an infrastructuring design approach that works toward open cultural commons can thus not only build upon the traditional commoning principles of rules-in-use but be extended to encompass culture-in-use.

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Sanna Marttila works as a project leader in Aalto University, Media Lab. As a designer Sanna's interest includes open and collaborative design and creative re-use of digital cultural heritage. She is the founder of the AvoinGLAM initiative in Finland.

6.

Computer Supported Cooperative Work (CSCW)
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Infrastructuring for Cultural Commons

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Abstract. In this paper we reflect on our involvement in the design and development of two information systems: *Fusion* and *EUscreen*. Both are infrastructural initiatives aimed at contributing, from different angles, to wider public access to and appropriation of the European digital cultural heritage. Our analysis is founded on the notions of an *installed base* and *gateway* in information infrastructure development. We situate our co-design activities and infrastructuring strategies in relation to a broader interest in advocating not only the preservation of and access to digital cultural heritage, but, more importantly, enabling collaboration, to support the emerging practices of diverse user groups, and to contribute to *cultural commons*.

Keywords: Infrastructuring, Co-design, Commons, Cultural heritage, Practice

1. Introduction

In recent decades, European countries and their cultural and memory institutions (e.g. libraries, archives and museums) have invested heavily in efforts to digitize cultural heritage content by creating digital reproductions and copies of cultural artefacts, such as documents, paintings and audiovisual materials.[1] Increasingly large-scale conservation and digitization initiatives are building infrastructures for archiving cultural heritage in digital forms, and creating access to this common, shared history and culture. For institutions these digitalization initiatives create potentials for the long-term preservation of their collections, as well as for expanding public access to and use of their holdings (for examples of initiatives see (Sotirova et al. 2012). Inviting people to interact with these growing digital cultural heritage collections enables new channels and means for enjoying and experiencing culture and history, and potentially encourages cultural appropriation and creative re-use of these collections in various sectors of society.

[1]It should be noted that 'cultural heritage' or 'memory institution' are not unproblematic terms, and controversies have arisen both regarding the representation of memory, and about what counts as heritage and historical materials and what does not. In this article we refer to memory institutions as being contested, complex sites that preserve and care for a repository of public knowledge, and which shape cultural meanings and understandings through various processes of knowledge production. According to (Stainforth 2016) the term memory institution has been developed over the past 20 years to describe entities that are connected through digital technologies and media, and denotes cultural integration across nations.

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Despite these efforts to increase open access to digital cultural heritage, today, only a small fraction of the digital holdings in Europe are being made accessible to the wider public by cultural institutions (Stroeker and Vogels 2014). In cases where digital cultural heritage materials have been made accessible online, they are often released under restrictive terms of use (Bellini et al. 2014; Estermann et al. 2015; Estermann 2015) and the scope for circulation and collaborative re-use of digital heritage is often limited (Terras 2015; Marttila and Hyyppä 2014a). As argued by many scholars (Tsolis et al. 2011; Anderson 2013), copyrights and other rights issues are an important factor preventing democratic access to and use of our digital cultural heritage. Intellectual property rights and privacy issues limit institutions in multiple ways – it is often the case that either the institutions do not hold the rights to everything in their collections, or they do not have the resources to conduct the process of clearing the rights. Commentators also point out that many culture and memory institutions fear a loss of authority and control over their collections, or fear losing possible sources of future revenue if they release digital cultural materials on more open terms (Tsolis et al. 2011; Verwayen et al. 2011).

Along with these institutional efforts to digitize cultural heritage and create online access to collections, an abundance of digital tools and platforms have been created to stimulate and support so-called amateur and peer-to-peer efforts to access, appropriate and reinvent culture (Bruns 2008; Jenkins 2006; Bauwens 2009). Due to these infrastructures that mediate digital culture, and the concomitant socio-technical media practices, today, large groups of people and communities are engaged in a variety of cultural-production practices that both create new forms of digital cultural heritage and, at the same time, circulate older forms of heritage in novel ways. These rich infrastructures encompass everything from hobbyist communities that document their own cultural practices and content in commercial settings, such as *Instructables*, *Flickr* or *Pinterest*, to community efforts that use infrastructures such as *Wikipedia* and *Wikimedia* Commons to create alternative cultural heritage repositories (e.g. the Wiki Loves Monuments initiative, and the project on Public Art on Wikipedia), to general social-media platforms that are arenas for new forms of digital culture (e.g. animated GIFs, memes).

We believe there is great potential in fostering a productive, collaborative relationship between, on the one hand, institutionalized digital cultural heritage preservation initiatives, and, on the other hand, amateur and peer-to-peer online media practices and infrastructures. Moreover, we are interested in acknowledging digital cultural heritage infrastructures as being not only concerned with preservation and access to digital cultural heritage, but also as important catalysts in the construction of shared cultural resources that are equally concerned with enabling collaboration between a diversity of audiences. In order to address these broader interests in this paper we reflect on our involvement in the design and development of two infrastructural initiatives aimed at contributing, from different angles, to wider public access to and cultural appropriation and re-use of European digital and audiovisual cultural heritage. The first infrastructure, named *Fusion*, aimed to develop a peer-to-

peer audiovisual file-sharing system for creative communities and their emerging media practices. The second initiative, *EUscreen*, developed a Europe-wide portal for digital audiovisual heritage.

To frame these two cases we build on the concept of commons, understood as particular arrangements for managing and governing shared resources (e.g. Ostrom and Hess 2007; Benkler 2013; Bollier and Helfrich 2012). Our focus is particularly on the characteristics of the concept that has lately been referred to as cultural commons (Madison et al. 2010; Hyde 2010; Hess 2012; Bertacchini et al. 2012). To analyse these cases we combine this broader framing of commons with a discussion of the concepts of infrastructure and infrastructuring processes, as being central to contemporary discussions of design (Star and Bowker 2002; Karasti 2014).

Research on the collaborative design of infrastructures for digital cultural heritage has devoted little discussion to the *becoming of* infrastructure (Stuedahl et al. 2016), and to which infrastructuring strategies this becoming of entails. In this paper, we employ reflexive analysis of *Fusion* and *EUscreen* to explore possible strategies for collective infrastructuring, and interrogate how infrastructures and the conditions that surround them can be instrumental in constructing and contributing to cultural commons. Presenting insights and findings from the collaborative design efforts made for the infrastructures in question, the paper thus addresses the complexity and limits of infrastructuring for cultural commons.

The article begins by bringing together the concepts central to discussions on commons, cultural commons, infrastructures, and infrastructuring from the selected literature so as to illuminate and contextualize the empirical work done in the two design cases that form the foundation of our study. Against this backdrop we then discuss and reflexively analyse some of the infrastructuring strategies and design solutions deployed in these projects. In doing this we make use of the concepts of *installed base* and *gateway* that have been developed within studies on infrastructures. We conclude our exploration with a discussion of the need for more flexible, open-ended and commons-like approaches in infrastructural design.

2. The backdrop: cultural commons and infrastructuring

Interdisciplinary research on commons is rooted in the study of shared natural resources and of the people and social dynamics involved with them. This research tradition has documented several ways in which communities formed around a set of common-pool resources (CPR) – traditionally being linked to forests, fisheries and/or land – have developed institutions and means of collectively governing them (Ostrom 1990). Commons arrangements are thus ways of caring for and sometimes earning a living from a CPR in a sustainable manner without depleting those resources. The particular arrangements for each commons are unique, but in general they fall outside better-known private or public-property strategies. Because governing a successful and sustainable CPR is not a straightforward endeavour, commons (according to this research tradition) are described as a governance regime

for shared resources that are vulnerable to social dilemmas (Ostrom and Hess 2007). Potential problems – social dilemmas – with these natural commons are often located in the use, and especially the overuse/over consumption, of shared resources (Hardin 1968).

Since the mid-1990s, scholars have proposed that the 'information commons' and the 'knowledge commons' emerging in the digital age are as relevant a subject of study as the more traditional natural commons (Hess 2008; Frischmann et al. 2014). Information commons have often been characterized as intangible or immaterial. In these types of commons, the social dilemmas and challenges are also associated with congestion and free-riding, but the dilemma of scarcity or depletion – typical of natural CPRs – works in different ways. It is argued that these types of new commons follow a logic of abundance and non-rivalry, rather than scarcity, but that they are nonetheless susceptible to new types of enclosure and commodification (Ostrom and Hess 2007; Boyle 2008).

The origin of the discussion about cultural commons in the digital and networked era can be traced back to two ideas about particular freedoms related to culture, and specifically to cultural re-use and appropriation. The first argument is built around the right to access and appropriate knowledge and culture that are, or should be, common. Lessig's (2002, 2004) writings on free culture emphasize that people should have the right and the tools to create and build upon the found digital culture, including on the Internet, and that people should be able to share their new derivative and creative works. This argument became one of the foundations for initiatives such as Creative Commons (CC) that offer a partial design solution in the form of a licensing framework and tools that could enable people to share and create new cultural production on more flexible terms than the existing intellectual-property regimes (IPR) allowed. Frameworks like CC can potentially support people in pooling creative digital resources to achieve common benefits, and eventually create digital commons. Benkler has summarized this argument as follows: "If we are to make this culture our own, render it legible, and make it into a new platform for our needs and conversations today, we must find a way to cut, paste, and remix present culture" (Benkler 2006).

The second argument is built around the need to safeguard common resources from commodification. For example, Boyle (2003) propounds a narrative of enclosure, and discusses the threats of privatization and commodification that are confronting many common digital goods and resources today. According to Boyle this "second enclosure movement", e.g. the withdrawal or fencing off of information and digital cultural artefacts, is made possible by new technologies and mechanisms available online. Later on, Boyle (2008) has also discussed battles over intellectual property, and how the current regimes are harmful to our culture, creativity and innovation. When he discusses the "networked commons of the mind", he argues that the problems do not lie in rivalry over commons, but in other collective-action dilemmas, such as the lack of incentives and motivation to create common resources to begin with (Boyle 2008). Along the same lines as Boyle, but with a different

vocabulary, Hyde (2010) defends cultural commons by developing an argument and a plea for our common culture, emphasizing how knowledge is common to all and should be safeguarded from commercial interests.

The use and development of the concept of 'cultural commons' in scholarly literature are recent. In addition to the more philosophical perspectives put forward by Lessig (2004), Boyle (2003, 2008) and Hyde (2010) as discussed above, there are also several more empirically grounded studies on cultural commons that have focused on the institutional arrangements surrounding them, and have investigated these as arenas of collective action (Bertacchini et al. 2012; Madison et al. 2010). The term 'cultural commons' has also been utilized as a political vehicle or strategic tool for pursuing change in the cultural sector (for examples see e.g. (Edson 2015; Edwards and Escande 2015). In addition, cultural commons have become a favoured concept for discussing how ordinary people can take part in the processes and practices of culture institutions. Hence, cultural and memory institutions are increasingly exploring ways of creating new partnerships with their publics and of opening up the possibilities for people to curate, collect, contextualize and create cultural works from their digital collections (see e.g. Ridge 2014). It should also be mentioned that, already a decade ago, "participation culture" was being used as shorthand to refer to new modes of media practices and production that rely on social networks, participation platforms and common-pool like resources on the Internet (see e.g. Jenkins 2006; Benkler 2006).

While cultural commons is indeed quite a broad concept, in this paper we focus on the cultural resources that both cultural and memory institutions are responsible for preserving and creating access to (including the practices related to them), and the cultural materials that people create in their everyday life. From this perspective "cultural commons" are evolving commons, cumulative in nature, sites where various positioned groups and individuals negotiate the value, creation, use and governance of diverse cultural resources. These groups not only shape our common cultural heritage and memory, but also create common-pool resources and knowledge commons.

It is important to recognize that institutions' common-pool resources of digital cultural heritage, and their management, differ significantly from commons-based peer production and participation systems online. On the one hand, in this case, the official institutional processes of digitization, archiving and preservation are often guided by rigorously defined best practices, policies and standards (e.g. the EBUCore metadata standard for audiovisual collections based on Dublin Core). On the other hand, the governance and management of common resources relies more on evolving social practices co-developed by community members in more flexible and fluid processes. A well-known example of this flexible process is the community-created folksonomies that emerge through the use of the hash-tag symbol (#) on Twitter, and which add additional context and metadata, and make the navigation and organization of content easier. Also, on YouTube there are ever-evolving social practices for e.g. initiating and sustaining audiovisual dialogue

between community members, developing new genres, and the creation of workarounds for annotating and manipulating video (Wesch 2008; Botero et al. 2010).

Because of these differences in approach, it is often the case that digital cultural heritage resources shared and maintained by institutions are associated with infrastructures and practices (both technological and social) other than those in and through which everyday users and communities engage. There are, of course, some initiatives emerging that aim to build bridges between these two sides. First, from an institutional perspective is worth mentioning *Flickr Commons*, an online repository that provides open, free access to digital images whose copyrights have expired or are unknown. Flickr Commons allows the general public to use published images without restrictions, and also provides a means for people to enrich the photographs by adding comments or other metadata on the platform. Flickr Commons has grown into an open, online catalogue of historical and archival images contributed by a variety of memory institutions, having started as a pilot project in which one institution collaborated with *Flickr*. The second example derives from the strong *Wikimedia* community, with the *GLAM-Wiki* initiative having created concrete practices and formed partnerships with memory institutions that are interested in sharing their offerings on Wikipedia and Wikimedia. These collaborations have taken multiple forms. For example, the Wikimedia community has improved online articles about some of the participating institutions' objects and collections (through the Wikipedian in Residence program); alternative cultural heritage repositories have been collectively developed (e.g. Wiki Loves Monuments); and the community has also developed specific software tools to aid memory institutions (e.g. to make batch uploads to Wikimedia via the GLAMwiki Tools project). Through initiatives like these, institutions and communities alike are attempting to contribute to global cultural commons. In these two examples the platforms used have first served people and their collaborative efforts (e.g. media sharing), and only later, when user volumes have grown and novel media practices have become more established, have digital cultural heritage institutions entered the platforms. There are also other recent efforts, such as *Europeana Labs*, that attempt to bring memory institutions' own platforms and practices together with community practices and community-created content and software.

In most cases, unfortunately, memory institutions pool their collections and offerings for open access, but do not pay sustained attention to people's actual media practices. It is also common for institutions not to offer the means for people to take part in decision-making or governance of the emerging cultural commons. It can also be the case, when commercial platforms are involved, that the future sustainability of the efforts becomes uncertain, and that co-optation threatens the harvested resources. Weaving connections to overcome the constraints that keep institutions' and communities' platforms and practices apart, and thus limit the emergence of truly cultural commons, is still a big challenge. What issues and processes should be brought into consideration when the particular conditions for contributing to cultural commons

are taken seriously? These remain underdeveloped areas of research, which we aim to address in this article.

In design studies, the concepts of common, commons, and engagement with the commons literature have been of particular interest for the Participatory Design approach (Björgvinsson 2014; Seravalli 2012; Teli 2015). Participatory Design (PD) practices share commitments and foundations with the commons literature, for example, they both build upon the capabilities and rights of people to act, negotiate, and decide on their own futures; both traditions discuss the potentials and dilemmas of collective action; and in both traditions there is an interest in understanding which types of infrastructures could support collective action (Marttila et al. 2014). Moreover, in line with PD's political commitment, an argument has been made that PD should seek to align its efforts with and contribute to digital infrastructures and spaces that specifically nurture commons (Teli 2015; Hakken et al. 2015). In order to pursue this interest in nurturing and sustaining commons, we will next review the relationship between infrastructure and infrastructuring, and clarify what our cases can tell us about engaging in infrastructuring for cultural commons.

Infrastructures are often defined as common-purpose structures that are designed and built to support human action, a sort of assemblage that carries and transports other things, in the way that a road, a bridge or a cable does. Most of the time, when these assemblages are "finished", they turn into a sort of substrate that disappears into the background. Taking as a starting point previous work on the growing importance of information infrastructures as an integral part of contemporary life (Star and Ruhleder 1994; Neumann and Star 1996; Star and Bowker 2002), the argument has been made that we should consider infrastructures more in their ongoing, relational terms. Scholars in traditions such as Science and Technology Studies (STS) and Information Systems studies (IS) have proposed that infrastructures are not merely substrates that disappear or things that are built and then left behind, instead infrastructures are constantly in the process of change and *becoming* (Neumann and Star 1996; Star and Bowker 2002; Karasti 2014) and therefore it is critical to trace backwards and forwards the relations that are created between people, materials and structures at all levels (Star and Ruhleder 1996). To trace the implications of this relational view more accurately, Star and Bowker (2002) suggested that it is more interesting to ask 'when' something is being perceived as an infrastructure by its users, rather than 'what' an infrastructure is.

These long-term, relational preoccupations have led to a renewed interest in the doing and making of infrastructures, in what has been called "infrastructur*ing*". Infrastructuring can be considered as a framework for thinking about design activities in more emergent terms (Karasti and Syrjänen 2004). This approach to design stresses that, instead of focusing solely on particular artefacts and neglecting the surroundings in which the artefacts are placed, it is specifically the surroundings that become of critical concern (Pipek and Syrjänen 2006; Pipek and Wulf 2009). As characterized by Star and Ruhleder (1996), and further elaborated by (Pipek and

Wulf 2009), information infrastructures are always rooted in social and technological infrastructures. This means that there is what these authors term an ***installed base*** for any given infrastructure. This installed base can be technological, but it can also consist of social arrangements and practices. Given the presence of an installed base, any new part added or new whole contributed will inherit some strengths and weaknesses from that base. According to Neumann and Star (1996), infrastructure building is also different from building other self-contained systems, in that doing infrastructuring requires linking many communities (already rooted in their own installed bases) into a larger network. Infrastructuring work thus requires that this larger network be made into an active participant, something that in turn inevitably results in various technical and social interdependencies.

Accordingly, when doing infrastructuring, a lot of design work turns towards creating a continuous alignment between different communities and between ways of doing things (Björgvinsson et al. 2010; 2012a, b) while accounting for the creative 'design' activities of professional designers and users, without necessarily privileging either view (Karasti and Syrjänen 2004; Pipek and Syrjänen 2006). Empirical research on how infrastructures emerge through infrastructuring has pointed out that such continuous-alignment processes are partly mediated by what is called ***gateways*** (Jackson et al. 2007). Gateways usually refer to assemblages and technologies that allow linking and bridging otherwise incompatible or disparate socio-technical infrastructures and practices. Most commonly, recognized gateways are technical appliances or interfaces that connect separate systems, networks or programmes together (David and Bunn 1988). However, as pointed out by Edwards et al. (2009) and Jackson et al. (2007), gateways should not be considered solely as technologies, but gateways are also socio-technical solutions. This is illustrated for example by the case of standards, which need to be integrated both into organizations and into the everyday lives of the people who use those standards, and thus develop new practices that act as gateways, too (Edwards et al. 2009). Organizations can also act as gateways and play an important role in mediating between systems and actors (Zimmerman and Finholt 2007). In a similar way to the installed base, a gateway can thus be technological, while it can also be a social arrangement and a practice. From a design point of view gateway-like effects can sometimes be achieved by setting up ***in-between infrastructures*** (Botero and Saad-Sulonen 2010). The concept of an in-between infrastructure denotes interventions and arrangements that enable experimentation among heterogeneous systems and with different actors *before* an actual infrastructure or its associated future practices have been settled. In-between infrastructures are thus temporary arrangements and socio-material assemblies, embedded in and emergent from a collaborative, or at least multi-user/multi-site, context that requires making provisional structures in order to move towards either more complete, more workable, or more formalized infrastructures. They allow those involved to rehearse future practices, and offer possibilities for understanding what the actual infrastructural initiative could require.

Next, we turn to the empirical cases and discuss some insights gained from these experiences, using selected concepts from the infrastructuring and cultural commons

approaches to give us a sounding board against which to project, reflect, and explore our experiences.

3. Tales of two infrastructures: Fusion and EUscreen

The purpose of this paper is to shed light on collaborative infrastructuring strategies in the design and development of infrastructures for digital audiovisual cultural heritage, and to suggest how design can contribute to sustaining and nurturing cultural commons. To elicit our argument, we draw on our past field and design work in the collaborative design and development of two information systems: *Fusion* (authors 1 and 2) and *EUscreen* (author 1). Fusion aimed at providing a decentralized software system and digital tools for ordinary people to publish and share community-created media, while EUscreen aimed to create wider public access to already existing, archived European audiovisual digital cultural heritage.

These infrastructures aimed at either 1) providing digital tools to support people's creative activities with, and sharing of, community videos, or/and 2) creating more meaningful and wider public access to, and facilitating the appropriation of, European audiovisual digital cultural heritage. Even if the projects that developed these platforms were different – as we will elaborate later – there were many similarities in the foundations and objectives of these endeavours. The core objective in both cases was to learn from pre-identified user groups' existing media practices, and to connect together and support the evolution of these practices in relation to the digital tools and services developed. The second fundamental aim was to stimulate and support people's emerging creative re-use activities on various levels (ranging from accessing media to social enrichment and video remixing), and to develop open-ended infrastructures and software capabilities that could be shaped and further appropriated by the general public.

Both platforms were designed for audiovisual collections, although the media files in these collections originated from highly diverse sources. In Fusion the videos were mainly user and community-created, while in EUscreen professionals from various European audiovisual archives and broadcasting corporations curated the sub-collections from their holdings. In addition, the platforms aimed to foster different use and creative activities. Fusion was targeted at helping communities of practice to share and produce community-created content in their mediated everyday life, while EUscreen is an access point for professional television programming and audiovisual heritage. Furthermore, the design approach to how to develop an infrastructure differed: in Fusion the starting point was communities and their practices, while in EUscreen the infrastructural development stems from the existing archival audiovisual content in various institutions. Even if these cases are dissimilar, and were carried out in different media and technology landscapes – the plan for Fusion was laid in the same year as YouTube was launched, while EUscreen's first version was made public when multiple video-sharing and editing platforms were emerging online – taken together these two experiences provide a broad view of the

infrastructuring challenges for digital audiovisual cultural heritage, and point to issues that we propose are central to the emergence of cultural commons across time.

Both of these endeavours were part of long-term research initiatives co-funded by the European Union, and involved multi-professional consortiums from various European countries. The projects evidently had multiple objectives and various research outcomes in different research domains. Our treatment of the specific cases, which follows, focuses more on the participatory design efforts for developing Fusion and EUscreen infrastructures for digital cultural heritage, and less on the more technical software-development issues, although we do give an account of some of these issues. We conduct our reflexive analysis through the lenses of collaborative infrastructuring using two intertwined concepts: Firstly, we aim to locate and bring to the fore some of the abundant installed bases that we have encountered. Secondly, we trace some of the socio-technical gateways and in-between infrastructures that we have designed or utilized in the projects. Using these concepts we highlight some of the design workarounds and ad-hoc arrangements we have devised to explore both the potentials of the envisioned social-technical systems, and the communities' emerging creative re-use activities and social practices.

These points are discussed and elaborated in the sections to come, however, first we present the cases individually in chronological order, and summarize the research activities, materials and participants.

3.1. FUSION – support for communities' everyday media practices

Fusion was an experimental peer-to-peer audiovisual file-sharing system for communities of practice and their creative activities. With Fusion communities were not only able to manage, share and archive their audiovisual productions in a decentralized way, they could also create customized audiovisual social media applications for themselves. The platform was developed as part of a three-year research project called P2P-FUSION[2]. The project had ambitious practical objectives. Firstly, it aimed at providing support for communities' social activities and media practices by encouraging the creative re-use of audiovisual content, specifically collaborative sharing, editing and enriching of videos, and providing tools for this. The second aim was to provide inbuilt software toolkit capabilities that would enable the development of social media applications, or the customization of existing applications to meet the needs of communities' particular practices. Thirdly, the project aspired to foster a conversation about finding solutions to various intellectual property rights (IPR) issues related to copyrights and the legal re-use of audiovisual materials.

[2] The Fusion platform was developed during the P2P-FUSION project (2006–2009) co-funded by the EU FP6 Framework program.

In terms of technology, the Fusion platform connected a number of layers: a peer-to-peer network for decentralized storage and distribution of media files, a distributed metadata layer with several social-processing and enrichment features (e.g. annotations and recommendations), an embedded licensing procedure for the content that utilized the *Creative Commons* licensing framework, and *Social Media Application ToolKit (SMAK)*, which included components that end-users could combine to create their own social-media applications (Figure 1). These were Fusion's main software components and were prototyped and used throughout the lifespan of the project, and have been integrated into other systems and infrastructures. The Fusion system itself is, however, not currently available.

The design and development of Fusion were carried out in collaboration with selected user groups and communities (referred as *content communities* within the project, and hereafter). Our design involvement in the project related mostly to these participatory design efforts, especially those for the SMAK toolkit, as this was Fusion's main interface with end-users. The collaborative design partners, participants and other stakeholders took part in various continuous, programmed interactions (e.g., interviews, design tasks, workshops). Table 1 below provides an overview of the main activities and empirical materials that formed the basis for our research (see Marttila et al. 2011 for a more detailed account of the co-design process for Fusion and SMAK).

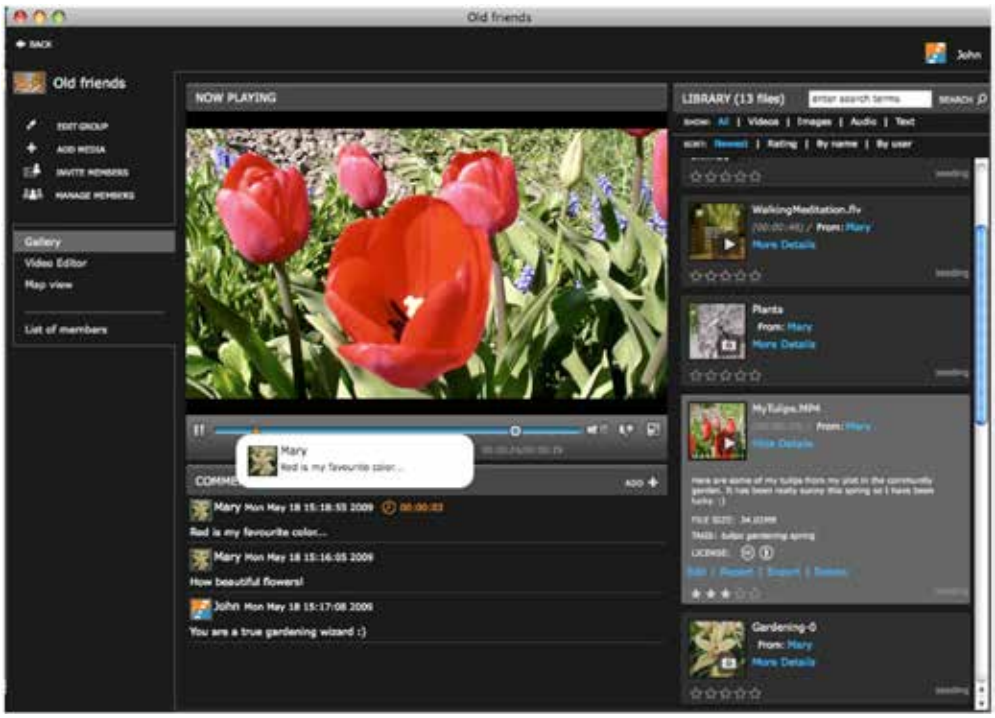

Figure 1. A screen shot of one of Fusion's social media application prototype built with the components from Social Application Toolkit (SMAK).

Table 1. Overview of the design research and collaborative design activities in the P2P-FUSION project, which were carried out in three different countries: Finland (FI), Hungary (HU), and The Netherlands (NE).

Activity	Participants and collaborators	Design research artefacts/ interventions
[A1] Identification and mapping of content communities. (FI, HU, NE)	Project partners.	Scoring criteria Overview data-sheet and selection table Community web presence
[A2] Selection of and invitation to content communities. (FI, HU, NE)	15–20 community representatives. Project partners.	Semi-structured interviews. Scoring criteria.
[A3] Information Days. (3) (FI, HU, NE)	20–30 community members Project partners.	Scenarios. Use cases. Media Inventories.
[A4] Local co-design workshops SMAK. (~15) (FI, HU, NE)	3–5 members from each community (8 communities) Design team: 3–4 members.	SMAK Toys kit (design game). Paper prototypes. Mash-up examples. Scenarios. Communities' own media.
[A5] International co-design workshops SMAK. (2) (HU, FI)	3–5 members from each community (3 communities). Design team: 3–4 members.	SMAK Toys kit. Functional SMAK prototypes – Community TV, Jose, Family Archive, Gallery. Paper prototypes. Scenarios.
[A6] Developer workshops. (2) (FI)	~7 external developers. Fusion developers: 3.	SMAK Toys kit. Scenarios. Fusion code and prototypes. (+ WebBridge)
[A7] Co-design and validation projects (2) – Education and Archive integration (HU, FI)	~25 students. 4 teachers. ~18 youth-club members. ~2 youth organizers. Project members and Fusion design team.	Fusion prototype (+ Publishing server) Archive Material. Video Essay assignment. Interviews. Questionnaire.
[A8] Co-design and validation experiments. (1) – Archive integration. (NE)	Project members (+ Archivists and cataloguer) Fusion developers: 1.	Fusion prototypes and proof of concept. (+Publishing server and SAVI) Archive Material.

All these events were recorded on audio and/or video, and the resulting design artefacts were documented (e.g. photographs, screen shots). In addition to the materials obtained through these specific co-design engagements, empirical data was collected in the form of field notes that were shared with the whole project consortium. In the case of the SMAK software development, we also made use of the discussions in the issue tracker and in the project-wiki documentation. As Fusion aimed to enable legal creative re-use of audiovisual materials, and of related copyright and intellectual property, the discussions were also collected into a public blog.

3.1.1. *Developing Fusion – co-design partners and participants*

Because there was no pre-existing corresponding technological environment to support the kinds of audiovisual practices that Fusion aimed to support, there were no existing users who could provide insights to aid the design and development of this infrastructure. With no clear, pre-existing user base, the main strategy implemented for the infrastructural development of Fusion was to engage such communities of practice as could benefit from the proposed infrastructure, without those communities necessarily being aware of such needs themselves. Consequently a lot of time and effort was invested in developing a methodology for identifying and inviting potential communities to collaborate in the project. These communities were to be active in some way in producing audiovisual media, and should already be creating, or at least interested in using, audiovisual media so as to document their community activities, to learn from each other, or to communicate with others about their activities. Findings and insights from some of our earlier research on emerging de-centralized audiovisual practices, such as amateur video documentation of skateboarding, also informed the infrastructural development of Fusion. The project was premised on the idea that a decentralized peer-to-peer (P2P) architecture could provide these types of communities with a more efficient and relatively inexpensive environment, one that could also give them control over their content (in terms of both privacy and of ample scope for open media sharing) as opposed to the more prevalent centralized server options that were being developed at the time.

The involvement of the communities as co-design partners was carried out in three phases: First, we conducted a mapping of possible content communities, in order to list promising co-design partners and to obtain a more profound understanding of their current community media content and their practices online. This information was used in the creation of various use cases that Fusion could support. The content communities were identified and selected on the basis of a methodology and of criteria developed by the project partners[3]. The list was initiated with the names of potential communities compiled through snowballing contacts and suggestions from the project partners' own networks in Finland, Hungary and The Netherlands. This list included a wide variety of

[3] The content communities selection and engagement in P2P-FUSION was conducted together with Stichting Nederland Kennisland (NE), Budapesti Muszaki es Gazdasagtudomanyi Egyetem (HU) and the University of Art and Design (TAIK), where the authors of this paper worked at the time.

interesting communities, varying from very technologically and socially organized amateur film makers and musicians, activists, senior-citizenship, citizen-journalism and media-education communities to other more informal, small-scale groupings represented by sports circles of snowboarders and skateboarders, music hobbyists, and family or parenting communities, all of whom already had some kind of audiovisual cultural production connected to their community practices [A1]. The list was made more specific and extended by surveying the identified communities' websites and discussion groups. Their interests and characteristics were further mapped, while other potential communities were identified at the same time. The initial list was then reduced to 30 promising communities, with ten communities selected from each country. For each of these 30 communities a standardized *overview data-sheet* was produced so as to be able to compare them in depth (through phone interviews, sometimes email correspondence, and by consulting their websites). After a thorough comparison had been carried out using a scoring model, the project partners then invited for interview 15 communities that were regarded as viable partners (five from each country) based on their number of members, the stability of the community, and their ability to commit to a co-design process [A2]. These *semi-structured interviews* aimed to present the general idea of Fusion to community representatives, to obtain a clear view of their ability and willingness to participate in the project, and to begin charting their current audiovisual practices and infrastructures. To kick-start the co-design process a series of *information day* events were organized in all three countries [A3].

In the second phase of the community engagement we expanded the collaboration with some of the selected communities, who participated in *co-design workshops,* created *scenarios* and *paper prototypes*, and used demos and *prototypes* of the social-media applications built specifically for them with *Fusion* [4,5,7]. The community involvement closely supported the design process for the *Social Media Application ToolKit (SMAK)*, and through it more indirectly Fusion's other software layers. The communities participating in the co-design of SMAK included: an online music makers' community that supported music and band-driven activities, such as concerts and promotion activities; an extended family, which consisted of geographically separated members, who shared their life events with each other using blogs and photo sharing services to keep the family connected; a volunteer-based folk-dance community that organized activities for children and youths, including traditional dances, singing, drama, play and performances, and who were interested in connecting more audiovisual media to these practices; and two sports-enthusiast communities comprised of acrobatics and parkour practitioners, who trained and organized events, which they documented on video and shared with community members and other communities, or then videos were captured to learn new moves and tricks. In addition, some specific use scenarios were explored with some educational communities and developer communities (e.g. mobile phone application developers) [A6]. Most of these co-design partners were located in Finland, where the design and development of SMAK was also carried out.

In the third and last phase of the co-design process, when a more developed software base already existed, the emphasis was on validating some more advanced and

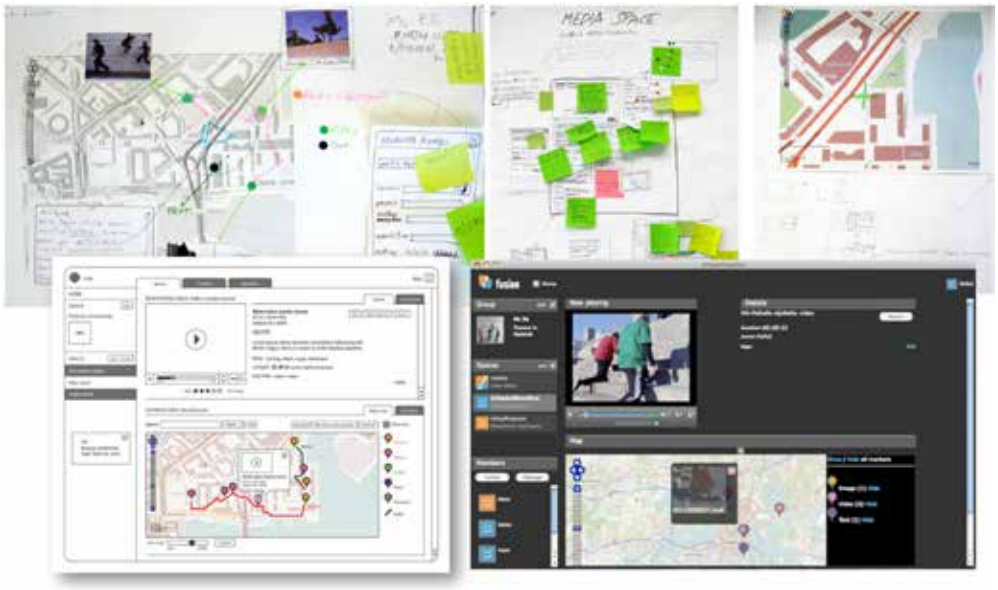

Figure 2. Paper prototypes of the parkour community's application concept, and the Fusion's map application.

specific use scenarios for Fusion via concrete proof-of-concepts (Figure 2). One of these was a model for using Fusion to compile media in educational settings. The second concept aimed to test the feasibility of Fusion as an alternative channel for publishing and distributing media content from memory institutions (e.g. national media archives), and acting as a potential link for feeding community created content into the archives of memory institutions.

These later forms of engagement then included an *exploratory project* organized in collaboration with teenage students and teachers from a secondary school in Budapest, Hungary, and the National Audiovisual Archives of Hungary. The students tested *Fusion* by using digital audiovisual heritage content from the NAVA archive in a concrete learning project linked to their curriculum [A7]. Another exploratory project consisted of a series of *experiments* and *proof-of-concept demos* carried out by The Netherlands Institute for Sound and Vision, and aimed to understand the implications and potentials of community-created content as new cultural heritage to be included in the archive's collections [A8].

3.1.2. *Understanding community media practices*

Since the content communities were the starting point for the infrastructural development, a lot of effort was invested in understanding the communities, their history, and current and emerging practices, and how these were mediated through audiovisual means. The selection process for the content communities provided the first systematic overview of the practices and the installed base that the Fusion system would inherit. By analysing the data-sheets, interviews and data gathered on information days [A1,2,3], we learned about the socio-technological factors present in these

communities, which were often products of trial-and-error experimentation, rather than a conscious development of mediated practices. These installed bases included e.g. multiple shared email addresses, memory sticks and hard drives, emailing lists, old floppy disks and tapes, mixed with online picture sharing collections. These assemblies of media and tools were not only used as a basic communication infrastructure, but also as informal archival and distribution systems for communities' audiovisual media production and other creative activities. The findings confirmed to those involved in the project that there is a need for software components that communities themselves can customize to better fit various different practices (e.g. in the form of SMAK components). The results of the community mapping also revealed the limitations of the few server-side audiovisual solutions available at the time, and the dependency on hard-to-contact and/or expensive servers, which hindered the communities' capacity to expand their audiovisual practices.

During the co-design sessions [A4,5,7] it become evident that the communities' installed base was a result of a creative – but also a very fragile – bricolage of different components and practices. To give an example of such a practice, some of the communities were regulating access to part of their content using simple strategies like acquiring multiple domain names, or using practices such as sharing easy-to-guess passwords. Doing the mapping helped some of the communities, as well as the design team, to realize that the communities relied heavily on existing social networks and on the identity they had already formed online. For most of the communities it was essential to be able to integrate any potential new software into their current digital media ecosystem. This was especially the case with their web services (e.g. simple content management systems and blog services), for which they had already created some workflows. Despite the original commitment to P2P solutions, it became evident that Fusion would also need to include ways of bridging the P2P network's contents and functionalities into existing web functionalities, as this was the most common installed base that the communities and their collaborators relied on. This is the backdrop to, and one origin of, the WebBridge application and gateway that is briefly discussed later in this article.

Just as the communities had their own installed base, the Fusion technology platform also relied on an installed base. Fusion was built as an open-source software project; parts of the platform were developed mostly utilizing existing open-source software and experimental P2P technology components developed prior to the project. At the time of the project, P2P technologies were mostly employed by specialists or "geek" communities, or used in very specific applications (e.g. simple file sharing). This meant that many of the protocols necessary for the new platform were not yet stable enough or standardized, which became a significant burden in the effort to build a generic platform. In particular, the project was unable to overcome Network Address Translation (NAT) traversal problems in the P2P clients. Because NAT methods for P2P varied, and some only used the server when establishing the connection, while others relayed all the data through it all the time, persistent incompatibilities and conflicts ended up adding bandwidth costs, increasing latency, or were detrimental

to real-time video sharing, and therefore entailed concrete user-experience limitations. Without overcoming this conflict, the benefits that P2P technologies offered these content communities could not be realized in practice. In addition, other technological difficulties, which are beyond the scope of this paper, created restrictions in terms of the limited video formats that the platform could support, the particular standards that could be relied on, and a number of other interoperability issues.

An additional installed base issue that arose here is that of copyrights. The installed base mixes elements of technology and social practices that have created hitches in the project. At times, the licensing support chosen for Fusion conflicted with some of the communities' existing media practices. For example, some community's event documentation used "borrowed" music for which they did not have a license of permission. Another community remixed copyrighted video materials without approval or consent from the copyright holders. Because Fusion aimed at explicitly facilitating legal creative re-use of audiovisual materials, the platform included an easy way to assign a Creative Commons licence that would specify the terms of sharing for all content or media files shared in Fusion. Implementing this mandatory software feature in the system forced users to select a licence for all media content injected into Fusion. However, adding this feature to the system did not necessarily mean that communities changed their media practices and started attributing material to the original sources. Nor did it mean that communities would start licensing their own work or would consider the various licence options, or using the Creative Commons licences outside of Fusion. Paradoxically, even existing public discourse around copyrights and media sharing on the Internet acted as a sort of installed base, and had a major impact on the way people approached Fusion. When Fusion was presented as relying on a P2P network, people often associated the system with "illegal" file sharing, probably because the technology first became known through platforms such as *Pirate Bay* and *Napster*.

3.1.3. *Gateways and in-between infrastructures*

The empowering impact that the system was hoped to achieve could not be fully concretized, and the final Fusion system did not fully meet the project objectives. In the following section we reflect on some of the bridges, the many gateways and the in-between infrastructures that we devised, or made use of, around *Fusion* in order to simulate the envisioned infrastructure and emerging media practices.

Following classic participatory design techniques we created a toy-like design game called *SMAK Toys*, in order to make visible both the content communities' installed base, and the installed base of the technologies used in Fusion. This SMAK Toys design game made it possible to run meaningful co-design workshops with a shared vocabulary among people unfamiliar with software development. *SMAK Toys* used magnetic cards (30) to represent different types of media content, and to create different uses and ways of sharing it (Figure 3). During the first workshops [A4] we used SMAK Toys to map communities' current and future media practices. We also co-created scenarios and paper prototypes of specific applications that could support

Figure 3. The SMAK Toys cards (left), mapping the media sharing practices in a parkour jam (right).

them (e.g. sharing photos and videos of a community event such as *Parkour Jam*). The individual cards functioned as 'building blocks' and formed a shared vocabulary that helped to create a common understanding of current media practices (accomplished by probing the communities' current installed base) and possible future media practices (accomplished using forthcoming Fusion social-media-applications concepts). The building blocks helped to make more concrete and visible what the community practices consisted of in detail, as well as to define and make visible the specific characteristics and functions that the new potential applications required (Figure 3).

This design game as an infrastructuring strategy was used at the design-before-use stage (Redström 2008) and aimed at mapping how community practices and the tools they use are connected to other socio-technical systems and materials. Ehn (2008) discusses the configuration of design patterns (building on Alexander 1964) as a way to support user participation, future use and appropriation. In our case, the design patterns operated in two ways: First, for the participating communities, the design patterns provided an analytic, structured and visual representation of their current media practices and installed base, something which they had rarely thought about or articulated to one another. In these sessions community representatives jointly reflected on their practices, and in many cases, after creating the maps and scenarios, community members reflected on their communities' own governance structures, on the power relations that they had not noticed before, and on possible social dilemmas that existed in their cultural production activities when using their current practices and tools. This facilitated articulation and questioning of what they wanted from Fusion's features, and even from their own installed base systems. Secondly, for the designers and software developers, the patterns provided valuable input in terms of recognizing existing and emerging

media practices, current and possible audiovisual materials, and the communities' concrete installed bases. All this formed the basis for the feature and function specifications for the software components of the Social Media Application ToolKit (SMAK).

Besides using participatory design techniques such as the SMAK Toys design game that served as a gateway to media practices, the project also prototyped several other concrete technical gateways. The first software gateway component, referred to as WebBridge, provided an interface between Fusion and the web, making it easier to share data and media content with other web-based applications or native applications. WebBridge was deemed necessary by many of the co-design partners, as they were not keen on putting a lot of effort into an experimental infrastructure that would not contribute to their online presence. Later, the WebBridge gateway also made it possible to develop the Fusion Mobile application. A second gateway component supported cases involving the integration of current archival infrastructure, with community created content coming from external software systems, into the archive's own catalogue system. This was made possible by conceptual mapping of the Fusion metadata to the archive's metadata formats (in this case the *Sound and Vision* archive) using a relatively simple custom-built Python script (SAVI). This proof-of-concept provided valuable input for understanding the requirements for the archiving in memory institutions community content that comes from external sources (i.e. What roles, working practices and collaborative arrangements need to exist between communities and archives for such an archival process to function?), and offered ideas about the potential for collaboration between official institutions and online communities (e.g. an archive could get assistance from communities to perform social tagging of archive collections) (Figure 4).

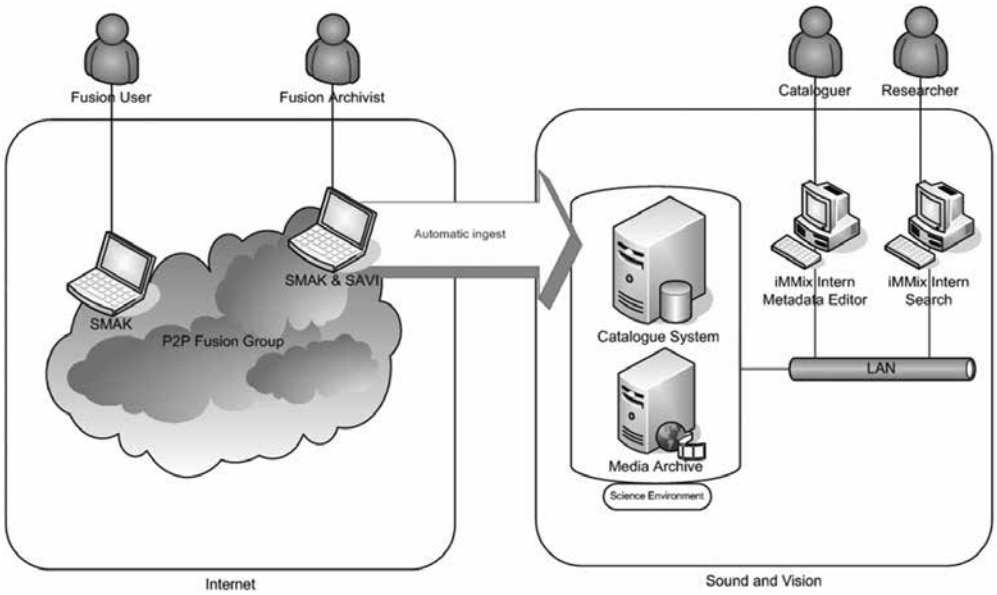

Figure 4. Schematic overview for the proof-of-concept scenario for archiving community content. Source: P2P-FUSION, sound and vision.

In addition other in-between infrastructure prototypes were built on immature and disparate socio-technical infrastructures to help translate some of the abstract components of Fusion into more concrete forms. First, these in-between infrastructures were produced as paper prototypes, and later as mash-ups using existing software tools (not necessarily based on P2P technologies). In the later phases of the project, we developed alternative functional prototypes to better communicate the envisioned functionalities and infrastructure to the participating communities. When some of the key future components of Fusion were delayed due to technical incompatibilities, we created alternative demos and pilots to enable hands-on experimentation and to obtain more realistic input as regards the adaptability of software toolkits for use in communities' practices (Figure 5 and 6). These were used to simulate and stimulate the becoming of infrastructure, its use and inhabitation.

The project also required a lot of mediation of shared understanding on various levels and between various stakeholders. One concrete example of a gateway created for this purpose was the various common-pool information resources compiled for different actors (e.g. community members and other end-user developers) in the form of wiki-based learning resources.

As discussed in this section the project encountered limitations in the key technologies and community practices that hindered the reach of Fusion and prevented it from being fully used. However, after having participated in the process, most of the communities did emerge from it with a clearer understanding of the place of audiovisual practices in the present and future of their community practices. Some communities, such as the extended family, started producing more video documentation that they then continued to share in an ad-hoc fashion, and others, such as the sports community, started more systematically exploring the use of emerging platforms like YouTube.

Figure 5. Co-designing community application concepts with SMAK Toys and paper prototypes.

Figure 6. Screen shot of the José pilot application (left) and the community TV pilot application (right) in Fusion.

3.2. EUSCREEN – access to european audiovisual heritage

EUscreen.eu is a platform that promotes access to and use of European television programming and audiovisual cultural heritage[4]. The technology platform allows multi-cultural and multilingual exploration of European audiovisual content, and encourages audience engagement with the offerings[5]. The audiovisual collection made available for EUscreen is curated by archives and national broadcasting corporations across Europe. The portal presents the items grouped under various themes (e.g. Arts and Culture, Conflicts) and genres (e.g. News), and includes broad metadata for the media, such as the broadcast date and geographical coverage (Figure 7).

The EUscreen platform aimed to support, on the one hand, multi-professional collaboration (across memory institutions), and, on the other, the creative audiovisual re-use activities of various user groups. To achieve these aims, the project adopted a collaborative design approach with various stakeholders in three main areas: defining and building a digital online audiovisual collection to populate EUscreen; designing a technology platform and its offerings; and understanding and supporting the emerging practices of creative re-use. Table 2 below summarizes the main design research activities in thematic order. It should be noted that, for the purposes of this paper and for our analysis, we concentrate only on the early design and development work on the

[4] The EUscreen portal was developed within two EU-supported projects: the EUscreen project (2009–2012), whose main objective was to design and develop the portal and produce an audiovisual collection of European television history, and the EUscreenXL project (2013–2016), which continued the development work, launched a new responsive interface and enlarged the audiovisual collection.

[5] Currently the EUscreen portal makes publicly available a wide collection of over 60 000 items of television programming, and over 1 million metadata records of more than 20 audiovisual archives and public broadcasting companies throughout Europe. Besides being a stand-alone platform, EUscreen is also the largest provider of audiovisual heritage to Europeana.eu (an interface for digitized European cultural heritage providing currently access to over 50 million records of digital culture).

Figure 7. The EUscreen landing page – beta version in October 2014 (left). The current landing page of EUscreen (right).

first beta version of the EUscreen platform[6], because the key infrastructuring decisions were taken during that time. In terms of the technology, the period of analysis covers the launch of the first public beta version of the platform and various parallel experiments carried out around it.

3.2.1. *Building the foundations for EUscreen – content and prototypes*

From the beginning, the project plan defined four very broad application areas for EUscreen: education, research, leisure and open cultural productions. These themes were already selected, based on previous work and collaboration by some of the consortium partners, when the funding application was made. The first phase of the project thus included refining and concretizing the characteristics and requirements of possible user groups and communities in relation to these thematic areas. Use-case narratives collected from all the project partners' previous experiences formed the bases for the initial functional user requirements made for the front-end development of EUscreen [B1]. Through further engagement with the selected user groups and stakeholders several use scenarios were created in the selected thematic areas [B2]. To validate the relevance of these use scenarios, evaluation sessions were conducted in various European countries, using the same design of testing protocol (including e.g. questionnaires, interviews and assignments) [B3]. Results from this previous process fed into two important activities: first, the audiovisual archives and public broadcasters providing media to the portal used them to create guidelines and criteria for a content selection schema in response to the devised scenarios. The content providers also prepared a set of shared metadata categories that everyone was to work with. Secondly, the project's technical and design partners used the scenario work to guide the design and development of the first version of the platform.

In order to build the audiovisual collection for EUscreen, and to clarify the possibilities for cultural appropriation and creative re-use that the portal was planning

[6] A newer version of the portal was launched in October 2014 as part of the work in EUscreenXL. Since that project ended, EUscreen has been maintained through a foundation structure.

Table 2. The EUscreen project's collaborative design activities and participants.

Activity	Participants and collaborators	Design research artefacts/ interventions
[B1] Definition of user groups and mapping of initial user requirements.	Project partners. Various invited collaborators.	Pre-existing knowledge. Initial functional requirements.
[B2] Scenario Framing.	12 Field experts. ~8 selected future stakeholders (e.g. teachers).	Use and user scenarios around research and leisure/ cultural heritage and open cultural production.
[B3] Scenario evaluation and testing in real-world settings.	38 participants (from 7 different countries during one month). Project partners.	Semi-structured interviews.
[B4] Mapping possible content and understanding archives' existing intellectual property and rights situations.	17 respondents from audiovisual archives and public broadcasters. Project partners.	7 Future-use scenarios. Online survey design and results. Audiovisual (AV) content samples.
[B5] Mapping of open audiovisual content.	5 representatives from archives and public broadcasters.	Structured interviews. AV content samples.
[B6] Co-design workshops (3).	8–40 participants. 2 Researchers.	EUscreen Wireframes. Paper prototypes. Visualizations.
[B7] Collection design (AV content selection).	Project partners (audiovisual archives and public broadcasters).	Future-use scenarios. Copyrights/terms of use clearance. Content-selection guidelines. AV content samples.
[B8] Collection experiments and testing (AV content selection)	Project partners. (audiovisual archives and public broadcasters) ~10 selected future stakeholders.	Open Images prototype. Virtual Exhibition prototype. Content selection guidelines. AV Content samples.
[B9] Co-design and testing workshops (2)	12–15 Students. 3 Researchers.	EUscreen Portal. Virtual Exhibition builder prototype. Thematic Virtual Exhibitions.
[B10] Open cultural production workshops (3) a. License to Remix, b. Make Open Video, c. Linking Media Workshop.	a. 11 young adults/3 external experts/2 video & VJ practitioners. b. 10 designers, developers and artists. c. 30 Students/1 teacher 2 Researchers.	Rehearsing practice exercises. AV content samples. Mash-ups and video remixes. Audiovisual compilations. Interviews.

to offer its users, a survey of intellectual property rights was carried out with the content providers [B4]. The survey included questions on each organization's

content selection and the copyright-clearance process. This helped us understand the scope of the rights and the terms of use of the material made available for EUscreen. Importantly it also investigated what kinds of creative use activities future EUscreen visitors could actually do with the audiovisual content on the portal (See Marttila and Hyyppä 2014a) for a detailed account of the survey and its design implications for EUscreen). As it turned out that a large part of the available content had lots of copyright limitations, many of the envisioned use scenarios were impossible to realize. Some of the responding institutions that showed an interest in and possibilities for releasing materials for EUscreen under more flexible and open terms were invited for further interviews and exploration [B5].

With the first working versions of the portal available, and a clearer idea of the concrete possibilities for supporting creative re-use with future EUscreen content, several co-design workshops were held to develop the main features, and to continue testing the concepts and scenarios developed [B6,7]. Due to the limitations caused by the copyright restrictions on the audiovisual collections that the project encountered in the first phase, the portal development did not encompass the more ambitious use and re-use functions (e.g. creating video playlists, extracting parts of videos as quotations, creating derivative works) envisioned in the advanced scenarios with the communities. The resulting EUscreen portal[7]. thus mostly had some core functionalities (e.g. searching, viewing items on a video player, and displaying metadata for each item from the collection) and limited content. To overcome these drawbacks, and in order to deepen our understanding of the challenges involved in creative re-use of online archival audiovisual materials, the project adopted a practical, design oriented perspective that included designing experiments, making alternative prototypes and staging events with a view to informing future EUscreen developments in more varied directions. To experiment and pilot open distribution of audiovisual heritage, a branded section was created for EUscreen on a separate hosting platform, *Open Images*, where five invited institutions released a selection from their video collections under a flexible Creative Commons licence [B8]. We also created an experimental prototype for EUscreen that allowed the combining of EUscreen content from different institutional sources and time periods. This prototype was called the Virtual Exhibitions (VE) builder, and as the name suggests it was a tool for curating and creating virtual exhibitions to be displayed on the portal. The prototype was designed and developed in close collaboration with user groups and participant institutions [B8,9].

In the last co-design phase we engaged with domain experts, practitioners, and selected user groups representing the fields of research, learning, leisure and open cultural production. All of them were deemed to be potential beneficiaries from using online archival audiovisual content and creative tools of the type that EUscreen could have in the future. In the same vein, all the exchanges provided opportunities to

[7] The EUscreen portal was designed by Aalto University (concept design and interaction design) and Noterik, a Dutch software development company specialized in audiovisual media.

identify ways in which future EUscreen developments could enable and support emerging creative activities, as well as supporting the advanced digital archiving of video. Three case studies centred on open cultural-production practices were conducted [B10]: A License to Remix! – a participatory video remix workshop – studied current and emerging audiovisual remix and mash-up practices among young people via participant observation and interviews. One of the central objectives was to understand the challenges involved in legal remixing, and to find ways that EUscreen could enable and support this. (For more details of the study see (Marttila and Hyyppä 2014b). The Open Video Make workshop invited advanced users and experts to create experimental interactive videos that went beyond traditional remixing by including open data and other not so well explored video features. Our aim was to study how practitioners were making use of temporal and spatial video characteristics and metadata, and how to support expert users within EUscreen. The Linking Media educational workshop was held in a high school as a part of a history course. The workshop aimed to study how students could learn about and deepen their knowledge of European history by creating rich audiovisual compilations that linked cultural heritage material to other sources, and by sharing these collections and stories online with others.

3.2.2. *Building on the installed base*

The installed base in EUscreen was heterogeneous and complex. Even when we set aside the various technology systems that it aimed to combine – an inventory would not serve the purposes of this paper – the installed base was truly a melting pot of different professional worlds and work practices combining archival practices, software design and everyday media practices, to name but a few.

Nevertheless, the installed bases that ended up having the most weight in the project were those related to content, since the foundations of the project were very much built on the audiovisual materials of the participating institutions. The EUscreen collections originate from several archives and public broadcasting corporations, and they therefore also inherit the installed bases of those institutions and collections. These included a wide variety of curatorial processes, collection management policies, multi-lingual and multi-cultural issues whose relevance varied according to the collection, a myriad of different metadata standards, incompatible classification schemas, and multiple video formats to deal with. These challenges were expected, since the project's key objective was to achieve an interoperable collection of television heritage, both in standardizing the metadata, as well as in harmonizing the complex copyright issues. In fact, this attempt to increase interoperability and improve access to European audiovisual heritage was already bootstrapped in another EU-funded project prior to EUscreen, whose history became part of this new future infrastructure (e.g. differences in work practices, sub-collections and formats were already identified as being important to overcome).

However, from the start it was the dissimilarity of copyrights and terms of use that posed the biggest challenge to the development of the socio-technical infrastructure.

As reported above, intellectual property issues, much more than the broad rhetoric of supporting creativity that underlies the project, clearly defined the final content selection for the EUscreen portal. Two examples illuminate this dilemma well: First, due to IP regulations and the challenges faced by the institution in clearing the rights, most of the video items available belong to the genre of news and current affairs, as these materials were often produced by the contributing institutions themselves, and consequently the rights to release them in EUscreen were easy to secure. While this type of content may be valuable to many user groups, it should be noted that many other types of interesting and useful content were excluded. These factors limited the scope of the heritage available on the platform, and its creative re-use value for the communities. Second, even though the content was enriched by detailed metadata, audiovisual content often requires other types of contextualization, or an engaging narrative, to be interesting or to become relevant. Again, the copyright restrictions on the EUscreen collection limited the possibilities for creating audiovisual stories that would combine materials from different sources and time periods – a very simple, basic use case that most people expected to be able to achieve with this type of content. It is also interesting to bear in mind, however obvious it is, that the consortium agreement and other legal contracts also added a strong layer to the foundations of the infrastructure.

3.2.3. *Gateways and in-between infrastructures*

To overcome the limitations imposed by the IPR restrictions, and to demonstrate the value of emerging media practices and creative re-use of audiovisual heritage, the project partners developed workarounds, demos and experiments in collaboration with representatives from the targeted user groups. For these, several pilots, co-design workshops and experiments were carried out in the form of gateways and in-between infrastructures.

A key in-between infrastructure developed to try to bypass some of the limitations of EUscreen's installed base was the creation of the Virtual Exhibition builder (VE) prototype (Figure 8). The prototype allowed the combination of the portal's audiovisual content and text to curate and create video exhibitions around a selected theme or topic. Using the VE builder it was possible for public broadcasters and audiovisual archives to curate their content and create a thematic sub-collection, with contextualization and a possible narrative, without actually joining or editing the clips together. The VE builder worked as an in-between infrastructure that connected parts of the audiovisual collection, its content-management system, and the software platform, and provided an interface for creating virtual exhibitions that were then presented on the actual EUscreen platform. As is often the case with gateway projects, the aim of the VE builder was to "hide" the complex infrastructure from the curators, and to create a bridge between practices, systems and different programmes.

The prototype was created in a co-design process together with selected representatives from the institutions taking part in the project as media content providers. Designing the VE builder and tools involved various activities, such as workshops, in

Figure 8. Screen shot of the Virtual Exhibition builder prototype (left) and the exhibition page (right) on the EUscreen portal.

which collaborative design methods were used to generate ideas, and to inform and improve the design [B6]. The VE builder prototype was tested with all the content providers in another workshop in order to mirror the design in the institutions' needs, and to obtain feedback on the usability of the tools. Some of the organizations also created virtual exhibitions from the selected highlights from their own collections. Additionally, some researchers tested the prototype and created their own thematic exhibitions to communicate audiovisual stories about historical topics or events. This prototype was also used in a workshop with students, who experimented with the VE builder to test the applicability of such a tool in educational settings. Unfortunately this prototype, though functioning, was not made available for public use due to the copyright restrictions (Marttila and Hyyppä 2014a).

Since it was not possible to allow downloading of the materials on EUscreen, in order to explore the more open and creative re-use scenarios developed for the portal, the project decided to make an experimental prototype on another existing platform for video hosting and sharing (Open Images)[8]. The EUscreen project created a separate branded section there, displaying content from a few of the EUscreen content providers who released their media under a Creative Commons licence. This workaround solution and simulation of the particular use scenario – downloading video for creative re-use – gave the involved archives a practical, positive experience of what it entailed to make their content open, what to take into account, and what to expect from open releases. For example, some very basic prejudices were overcome when none of the released content was used in ways that the institutions would have found non-respectful. But choosing the Open Images platform to showcase the open EUscreen content had one drawback, this time not in terms of copyright, but in terms of the quality of the

[8] Open Images is a Dutch initiative by Nederlands Instituut voor Beeld en Geluid together with Kennisland. For more information and to access the platform visit: http://www.openimages.eu/.

downloadable video; the low quality and the variety of video formats made re-use for new cultural works cumbersome.

The open culture workshops proved to be an interesting way to rehearse creative re-use practices, as well as to demonstrate the value of such practices in the context of the EUscreen project. They stimulated discussion around the topic within the consortium and with user groups, and provided valuable insights into what new requirements these emerging media practices place on socio-technical infrastructures. Two of the participatory workshops were held in collaboration with a local youth centre and a high-school, and the third was organized in conjunction with a larger festival run by the Open Knowledge movement. Besides bringing in new user groups to discuss these matters with us, these collaborating organizations played an important role in legitimatizing the activity and the approach to the rest of the consortium. Sometimes, the collaboration also created expectations that were difficult to manage and to meet, for example, in the case of the high-school teachers who were keen on continuing the collaboration and using in their courses the EUscreen tools that were ultimately not published.

4. From silos to commons?

Through reflexive analysis of the empirical cases of Fusion and EUscreen we have addressed two interrelated concepts that are central to infrastructuring processes: the installed base and the gateway. These notions were useful in discussing the socio-technical infrastructural development required for digital audiovisual cultural heritage, and for identifying infrastructuring strategies that could contribute to cultural commons. In the following, we summarize some of the key findings and infrastructuring strategies found from these cases.

4.1. Probing the installed base

A growing infrastructure inherits both the limitations and capabilities of the installed base. Due to the heterogeneous, evolving nature of a growing infrastructure, it is important to actively probe and reveal the possible connections and interdependencies between different infrastructural elements, resources and actors. As discussed in the treatment of the cases, in both Fusion and EUscreen the installed base significantly influenced the design and development work on the systems. A lot of time was invested in the infrastructuring work on two levels: reconfiguring and redesigning the connection points with and between actors and resources, and on the integration – or simulation – of these different parts. In Fusion, particular attention was paid to the communities and their practices, and to connecting them with some of the institutional practices and processes. As these practices differed greatly, it was a learning process for both sides. The application concepts and technological offerings were shaped according to the needs and wishes of the communities. In turn, in EUscreen the foundation for infrastructural development lay more in the institutional processes and the audiovisual content deriving from the institutions. If we adopt the

understanding of infrastructuring as a long-term relational process, contributing to the emergence of cultural commons cannot be done by relying solely on the technological or social aspects. Instead many other actors, resources and processes have to be identified and brought together in a strategy that considers content, communities and the technologies that can weave them together.

4.2. Stimulating and simulating use through gateways

The experiences gained from the cases considered here also demonstrate the importance of creating gateways and in-between infrastructures to bridge otherwise incompatible socio-technical infrastructures and practices. This reflects the special attention that needs to be paid when "bridging the gap between technology development and appropriation" (Pipek and Wulf 2009, p. 467). In both cases, however, for different reasons, creating so-called workarounds, demos and pilot projects became an essential infrastructuring strategy. In Fusion, the prototypes and software pilots were called for in order to simulate and stimulate future uses and practices (this includes both the creative re-use of media and end-user development), because the technology development was hindered by the limitations encountered in key technologies, challenges to connecting technology layers, and other interoperability issues. In EUscreen, the creative workarounds and infrastructuring activities were mainly called for by the legal and intellectual property issues (e.g. legal contracts, privacy issues and copyrights) related to the platform and to the audiovisual collection. In both cases, current and emerging media practices were rehearsed with various user groups and stakeholders through in-between infrastructures and assemblies of patched configurations of existing software tools and audiovisual media content.

An important infrastructuring strategy in relation to gateways in both projects was bridging between silos of the common-pool resources and practices connected with them. As discussed earlier in this article, there is a gap between the digital cultural heritage collections and the systems that are made accessible by the cultural and memory institutions, and the platforms through which people use, create and produce digital cultural works. By configuring situations and events, such as a participatory video remix workshop for young people, rehearsing the creation of virtual exhibitions with museum professionals, or creating the conditions for open audiovisual platforms, people and institutions together envisioned *what* an alternative infrastructure could be *if* there were no current technical or legal constraints. Weaving together contexts, social practices and language, often from significantly different work and media practices, is an important part of the work done to achieve the socio-technical infrastructures that could support cultural commons, and which we aimed to contribute to. In our cases the pilot applications and ad-hoc workarounds enabled the advancement of particular pieces of the infrastructure, but more importantly they supported the process of evolving the practices, and sometimes even the values and changing

attitudes, of the people taking part in the building of the infrastructure. Even if all of the qualities addressed and explored by the projects' in-between infrastructures and gateways were not implemented in the information systems, there is a good chance that they will be a part of the installed base of other similar infrastructures in the future, and hopefully contribute to creating awareness of the need for cultural commons.

4.3. Terms of use

In both cases the legal frameworks had a major impact on the development of the infrastructures. Both in Fusion and in EUscreen rights and terms of use were embedded in all the layers, starting from the Open Source software utilized. In EUscreen the audiovisual collections provided by the institutions had various copyrights and other rights issues attached to them, while in Fusion the project tried to promote an explicit sharing and attribution approach for the community-created content (via the Creative Commons licences). It became evident that copyrights, even when fairly liberal, shape the design, media materials and infrastructure practices in profound ways, thus presenting a practical challenge to the emergence of cultural commons. Communities making use of the offerings of these infrastructures have to continuously assess the legality of their actions on various levels, e.g. archival content, software building blocks, source code, as well as the platform's possible terms of use. Rarely are people invited and included in the process of shaping these rules of participation. Even in EUscreen and Fusion, which were designed in projects with a collaborative mindset, these terms were drafted by legal experts and implemented by designers and software developers. In the infrastructural development it is pertinent to ask: Who should decide how people interact, appropriate and innovate using common cultural heritage and history?

The key to understanding information infrastructures for digital cultural heritage, access to them and their use is addressing the diversity of the characteristics and mechanisms that can contribute to cultural commons. Commons are often thought of as a governance structure and process in which a specific set of rules is in place. However, rather than being explicitly defined and stated, these rules tend to arise from social practices and interactions among people connected to particular resources. In both of the cases reviewed here, the boundaries of common-pool resources and rules-in-use were defined, and sometimes even dictated, by the project partners. Even if the rules were partly formal and party informal, the formal social agreements (license agreement, consortium agreement) permeated the interactions between human and non-human actors. One of the key findings of the established commons-research tradition is that a rich and very specific set of rules has been in use in resilient commons over a long period of time. These rules were well matched to local needs and conditions, and people using and sustaining the commons had a

chance to negotiate these rules (Hess and Ostrom 2007, p. 7). The cases and experiences discussed in this article indicate that, *if* in the co-design of information infrastructures we would like to move towards more flexible, open-ended and commons-like approaches, then we need to direct more design attention and infrastructuring activities towards negotiating the governance regimes and terms of participation with all the stakeholders. Professional designers should reflect more on whether and how they impose their own values, politics, and attitudes through co-design and infrastructuring activities; as well as how these concerns are reflected in the design process, and in the emerging infrastructure.

In the case of EUscreen, the designers and software developers encountered resistance from the memory and cultural institutions that were providing audiovisual materials for the platform. During the development of the portal, the designers felt that some representatives from these institutions were reluctant to share authority or control over the materials. This hindered the participation and creative re-use activities. Along with complicated rights issues related to the released content, other challenges for collaboration might be at play. This observation is supported in the literature by a study mapping the factors hindering cultural heritage institutions' opening their descriptive metadata on cultural objects (Verwayen et al. 2011), and by a survey that studied the status quo for digitized and open cultural heritage materials, and the attitudes of cultural and memory institutions (Estermann 2015). However, when instances of concrete collaboration could be rehearsed in secure settings within the projects, everybody recognized the value and potential that existed here.

In the case of *Fusion*, the software development failed to attract end-user developers. Ironically, this might have been the result of the different layers of Fusion becoming isolated systems, centrally designed in different research institutions and controlled by individual developers. Even if the developed software is Open Source on all levels, commons-based activities and collective action becomes difficult if so-called end-user developers do not have a long-term investment in the infrastructure. In addition, there was little motivation or incentive for content communities to create common resources that would span different communities, even if the project had sought communities with similar interests in different countries. One problematic issue thus became that the co-design and infrastructuring efforts concentrated more on understanding communities' media practices and on translating them into design language, and not so much on facilitating potential developer communities or on tapping into existing common-pool software resources, before the software development (and the financed project) was in the final stage.

4.4. Rules of participation

Participating in and contributing to knowledge or cultural commons are often voluntary (as in the Wikimedia Commons already mentioned). In both of our cases, people participated in the co-design activities, e.g. in the hands-on workshops and hacking sessions on a voluntary basis. Sometimes tensions can arise if some people

are contributing without compensation on a voluntary basis, while others participate as part of their daily job (e.g. those employed by project partners or collaborating institutions, such as school teachers). Especially in the context of Fusion's co-design process there was an imbalance between how much time and effort the participants invested, and what concrete and intangible benefits participating community members gained from the process. In infrastructural development there should be an emphasis on collectively negotiating and articulating the terms of participation and on explicitly discussing everyone's expectations.

Common-pool digital cultural heritage resources are often selected and pooled by institutions or emerge through the processes of inclusion/exclusion that they tend to control, consequently the rules of participation end-up being dictated by those same institutions. A key point is questioning and paying attention to *how* these cultural materials are designated as 'cultural heritage' in the first place, as this is an originating site of definition and potential conflict, long-term friction, and shifting perceptions, where infrastructures are difficult to pinpoint and have mainly evolved in closed terms. Because of this, infrastructuring processes deeply influence the notion of the commons, and to whom it belongs, to whom its rules apply, and who gets to participate in setting those rules.

The relationship between different local and global needs is also relevant in our cases, as locally and nationally created and nurtured collections of media (both institutional and everyday arrangements) are subject to third-party commercial interests and commodification when pooled for a global, open infrastructure, and further subject to terms/rules of use that people can not influence. Interestingly, in the context of European digital cultural heritage, the EU has recently made significant efforts – through policy guidelines and channelling of funding, from which both of the cases discussed here benefited – to support monetization of this cultural commons globally, and creating new business models and opportunities for sustainability. Commons has often been considered an alternative or as complementary to the dichotomy between market and state, and yet the EU Commission's strategy for public cultural heritage seems to be directed at commercial sustainability, rather than at sustainable cultural commons.

5. Concluding remarks

In this article we have reflected on our participation in the design and development of two information systems: Fusion and EUscreen. These two infrastructural initiatives were aimed at contributing, from different angles, to wider public access to, and appropriation of, European audiovisual cultural heritage and digital culture in general. Through the notions of installed base and gateway we have shed light on some strategies for infrastructural development for digital audiovisual cultural heritage, and in the process discussed how design can contribute to sustainable cultural commons. We believe that engagement with the notion of installed base is a useful move for identifying and reviewing in depth what are the components of existing infrastructures and their characteristics, and how they are brought into being and put

to use. Probing an installed base can also reveal what conflicts and contradictions can be inherited in it, and in turn, contribute to the design contexts at hand. Active probing and understanding of an infrastructure's installed base can be a useful device for the design and development process, and can be helpful for better identifying infrastructural challenges.

The concept of gateway can be used as a practical infrastructuring strategy that helps to identify incompatible socio-technical infrastructures and practices, and identify any design workarounds, interventions and pilots necessary to bridge them, and to stimulate and simulate these new configurations. Learning from our cases we argue that initiatives that aim to support the revitalization of cultural heritage through digitization should focus more on the collaborative dimensions that their platforms and infrastructures are aimed at. Our experiences point to the importance of building bridges between different actors and resources, as well as weaving together different contexts and practices as potential infrastructuring activities that could be beneficial to all involved stakeholders. In addition, building on our cases we argue that creating socio-technical workarounds, ad-hoc arrangements and prototypes in order to simulate and stimulate the current and emerging practices is valuable for infrastructural development. These explorations have a specific role in enhancing technologies and practices, and further, in these staged instances, stakeholders have a possibility to collaboratively create common ground and build shared resources. If adequate, flexible gateways can be proposed during the infrastructural development, more cultural commons can arise.

Despite the limitations of these projects, experiences in Fusion and EUscreen reveal glimpses of the potential that exists when fostering a productive, collaborative relationship between institutionalized digital cultural heritage preservation initiatives and more amateur and peer-to-peer online media practices and infrastructures. Digital cultural heritage infrastructures, when not only concerned with preservation of and creating access to digital cultural heritage, can become catalysts in the construction of shared cultural resources that also enable collaboration between diverse audiences.

Doing the work of participatory, collaborative infrastructuring leads to, or makes visible, discussions of and frictions over what is useful and necessary in a given context, and what can be considered cultural commons and for whom. If digital cultural heritage initiatives take the collaborative dimensions of infrastructuring more seriously into consideration, then the likelihood of nurturing sustainable cultural commons improves. We hope our work is a contribution to that.

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History is a vital part of our future. Having meaningful access to and influence on our cultural heritage is key to democratic and self-reflective development of society.

In *Infrastructuring for Cultural Commons,* Sanna Marttila studies how participatory design and digital design endeavors can contribute to wider public engagement with digital cultural heritage. The work offers strategies for how to support and stimulate creative reuse endeavors of professionals and citizens alike by elaborating on open, democratic and collective processes of designing together.

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